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EXPLANATORY NOTES

OF _____

INCREASES, DECREASES, AND CHANGES IN LANGUAGE

IN THE BUDGET FOR THE

Procurement Section
Current Serial Records

DEPARTMENT OF AGRICULTURE

FOR THE

FISCAL YEAR ENDING JUNE 30, 1939

AND OF

WORK DONE UNDER EACH OF THE APPROPRIATION ITEMS

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FOREST SERVICEGeneral Statement

In summary, the increases and decreases in regular funds under the 1939 budget for the Forest Service consist of:

Increases:

National Forest Protection and Management.....	\$ 103,204
Private Forestry Cooperation.....	200,000
Cooperative Farm Forestry.....	1,229,421
Receipt Funds.....	<u>185,000</u>
Total increases.....	1,722,625

Decreases:

Acquisition of Lands for National Forests.....	2,000,000
Forest Roads and Trails:	
Forest Highways.....	2,466,667
Forest Roads Development.....	<u>3,033,335</u>
Total decreases.....	7,500,000

Both area and public use of the national forests steadily increase. For over four successive years, revenues from these properties also have steadily climbed, with prospects for continued upward trend next year if the man power and financial means are available to handle definitely prospective revenue-producing uses. This cannot be done within the limit of the current appropriation without dangerous relaxation of protection functions.

Destructive processes, probably not susceptible of complete cure without positive regulation, continue to deplete the wealth of private timberlands. The small amount sought for Private Forestry Cooperation will enable the Forest Service to initiate aggressive leadership and cooperation in key areas where through cooperative measures the public or national interest in the values of these forest lands can be afforded a degree of protection.

Under Cooperative Farm Forestry there are two major increases: The first, \$1,000,000 for the Prairie State Forestry Project, will place this undertaking on a firm financial footing and insure its orderly, successful progress. The value of tree planting as a chief means of ameliorating the distress conditions in the prairie States has now been amply proved. The returns from this project in the form of improved economic and social conditions can now be unequivocally guaranteed.

The second item, \$175,000 for farm woodland work, will permit a very modest beginning of the action program contemplated by the Congress in the Farm Forestry Act of 1937.

The reduction from \$3,000,000 to \$1,000,000 in the appropriation for Acquisition of National Forest lands will permit the Forest Service

to retain its nucleus of trained, experienced men in this field and to purchase a small number and area of key tracts within established national-forest units.

The reduction in the forest roads item is predicated upon the cancellation of the 1939 authorization, as recommended to Congress by the President in his message of November 27, 1937.

FOREST SERVICE

(a) SALARIES AND EXPENSES - PREAMBLE

Changes in Language

Changes in language in the preamble of the Forest Service section of the Appropriation Act have been recommended in the interests of simplification. These consist of the substitution of the words "For the employment of persons and means in the District of Columbia and elsewhere" in lieu of language which merely duplicates, in considerable detail, this same general authority.

(b) GENERAL ADMINISTRATIVE EXPENSES

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938.....	\$607,500	\$52,312	\$659,812
Budget Estimate, 1939.....	<u>607,500</u>	<u>- - -</u>	<u>-607,500</u>
Net change.....	<u>- - -</u>	<u>-52,312</u>	<u>-52,312</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
General administration and business service:				
Regular funds.....	\$565,232	\$607,500	\$607,500	- - -
PWA emergency.....	1,938	- - -	- - -	- - -
Emergency relief funds..	149,107	52,312	- - -	-\$52,312
Total (all funds).....	716,277	659,812	607,500	-52,312

WORK UNDER THIS APPROPRIATION

This appropriation is used for salaries and expenses of employees in the Washington office engaged on general administrative, facilitating, supervisory, and inspectional activities pertaining to the management of Forest Service work.

(c) NATIONAL FOREST PROTECTION AND MANAGEMENT

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938.....	\$11,425,950	\$2,984,616	\$14,410,566
Transferred to "Salaries and Expenses", Office of the Solicitor.....	-14,400	- - -	-14,400
Transferred to "Salaries and Expenses", Office of the Secretary (for rent).....	-15,000	- - -	-15,000
Total available, 1938.....	11,396,550	2,984,616	14,381,166
Budget Estimate, 1939.....	11,504,754	- - -	11,504,754
Net change.....	+ 108,204	-2,984,616	- 2,876,412

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase or decrease
1. Timber use:				
Regular funds.....	\$988,324	\$1,094,104	\$1,194,104	+\$100,000(1)
ER funds.....	118,599	23,800	- - -	-23,800
Total.....	1,106,923	1,117,904	1,194,104	+ 76,200
2. Forest fire prevention and preparedness:				
Regular funds.....	3,111,614	3,343,988	3,343,988	- - -
ER funds.....	358,842	85,000	- - -	-85,000
Total.....	3,470,456	3,428,988	3,343,988	-85,000
3. Forest fire suppression:				
Regular funds.....	210,074	212,257	212,257	- - -
ER funds.....	47,730	15,500	- - -	-15,500
Total.....	257,804	227,757	212,257	-15,500
4. Protection against tree insects:				
Regular funds.....	114,109	115,301	115,301	- - -
ER funds.....	259,626	123,000	- - -	-123,000
Total.....	373,735	238,301	115,301	-123,000
5. Control of blister rust and other tree diseases:				
Regular funds.....	361,125	404,878	504,878	+ 100,000(2)
ER funds.....	324,983	160,500	- - -	-160,500
Total.....	686,108	565,378	504,878	- 60,500

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase or decrease
6. Timber stand improvement:				
Regular funds.....	\$85,423	\$86,314	\$86,314	- - -
ER funds.....	593,829	93,000	- - -	- \$93,000
Total.....	679,252	179,314	86,314	- 93,000
7. Reforestation and re- vegetation of denuded areas:				
Regular funds.....	180,430	182,312	182,312	- - -
ER funds.....	676,967	158,905	- - -	- 158,905
Total.....	857,397	341,217	182,312	- 158,905
8. Nurseries and planting stock:				
Regular funds.....	277,833	280,728	280,728	- - -
PWA lieu funds.....	2,381	- - -	- - -	- - -
ER funds.....	181,500	31,000	- - -	- 31,000
Total.....	461,714	311,728	280,728	- 31,000
9. Grazing use:				
Regular funds.....	1,053,569	1,094,527	1,094,527	- - -
PWA lieu funds.....	482	- - -	- - -	- - -
ER funds.....	101,810	20,800	- - -	- 20,800
Total.....	1,155,861	1,115,327	1,094,527	- 20,800
10. Recreation and land use:				
Regular funds.....	494,066	539,211	524,211	- 15,000(3)
ER funds.....	240,873	69,500	- - -	- 69,500
Total.....	734,939	608,711	524,211	- 84,500
11. Land classification, settlement, and claims:				
Regular funds.....	80,768	81,603	81,603	- - -
ER funds.....	9,856	2,100	- - -	- 2,100
Total.....	90,624	83,703	81,603	- 2,100
12. Acquisition of land by direct purchase:				
Regular funds.....	156,373	157,999	157,999	- - -
ER funds.....	250,000	50,000	- - -	- 50,000
Total.....	406,373	207,999	157,999	- 50,000
13. Acquisition of land by exchange:				
Regular funds.....	77,792	78,604	78,604	- - -
ER funds.....	13,947	2,100	- - -	- 2,100
Total.....	91,739	80,704	78,604	- 2,100

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase or decrease
14. Fish and game protection:				
Regular funds.....	\$354,175	\$357,861	\$357,861	- - -
ER funds.....	165,792	46,000	- - -	-\$46,000
Total	519,967	403,861	357,861	- 46,000
15. Construction of truck and horse trails:				
Regular funds.....	396,537	400,658	400,658	- - -
16. Maintenance of truck and horse trails:				
Regular funds.....	184,443	186,358	186,358	- - -
17. Construction of improve- ments other than roads and trails:				
Regular funds.....	883,395	877,583	800,787	- 76,796(4)
PWA emergency.....	8,319	- - -	- - -	- - -
ER funds.....	7,036,634	1,800,232	- - -	-1,800,232
Total.....	7,928,348	2,677,815	800,787	-1,877,028
18. Maintenance of improve- ments other than roads and trails:				
Regular funds.....	1,310,792	1,524,434	1,524,434	- - -
ER funds.....	979,409	238,000	- - -	-238,000
Total.....	2,290,201	1,762,434	1,524,434	-238,000
19. General surveys and maps:				
Regular funds.....	177,961	179,810	179,810	- - -
ER funds.....	320,026	65,179	- - -	- 65,179
Total.....	497,987	244,989	179,810	- 65,179
20. Equipment and stores:				
Regular funds.....	112,823	113,992	113,992	- - -
21. Cooperation with other departments, bureaus, and agencies:				
Regular funds.....	83,159	84,028	84,028	- - -
Total obligations:				
Regular funds.....	10,694,785	11,396,550	11,504,754	+ 108,204
PWA lieu funds.....	2,863	- - -	- - -	- - -
PWA emergency.....	8,319	- - -	- - -	- - -
ER funds.....	11,680,423	2,984,616	- - -	-2,984,616
Total.....	22,386,390	14,381,166	11,504,754	-2,876,412

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase or decrease
Unobligated balance (regular funds).....	\$111,365	- - -	- - -	- - -
Total, Regular funds... (a)	10,806,150	\$11,396,550	\$11,504,754	+\$108,204(A)
" PWA lieu funds..	2,863	- - -	- - -	- - -
" PWA emergency...	8,319	- - -	- - -	- - -
" ER funds.....	11,680,423	2,984,616	- - -	-2,984,616
Total, All funds..	22,497,755	14,381,166	11,504,754	-2,876,412

(a) For 1937 excludes \$9,800 transferred to Office of the Solicitor.

INCREASES OR DECREASES

(A) The increase of \$108,204 in regular funds for 1939 consists of:

(1) An increase of \$100,000 for timber sale work.--This increase is needed to provide the personnel required for the administration of commercial timber sales and for surveys and appraisals preparatory to the sale of additional quantities of timber.

More business requires more men and money for its administration. In this case the increase in business means also an increase in revenue to the Treasury, and the increase in appropriation for handling the business will be much smaller than the increased revenue. Trained men are needed to cruise and appraise the timber, to plan for its orderly disposal on a sustained yield basis, to mark the trees to be cut so as to leave the forest growing, to scale the cut timber, and to supervise the cutting so as to prevent unnecessary injury or waste and to obtain compliance with the contract. Fairness to the purchasers and the protection of the Government's property both necessitate skilled workmanship. Upon completion of sales it is necessary to recruise the areas to determine the residual stand to which growth data may be applied in planning the time and amount of future cuts. Inexperienced or untrained men, such as WPA employees, can not do this work.

With the expected stimulation of building under the present program of the Administration, the increase in value of timber to be cut on the national forests in fiscal year 1939 is estimated at \$400,000. Allowing for wide variations by sizes of sales and by regions, the cost of handling this increase in business can not be estimated at less than the \$100,000 requested. For one thing, the cruising and appraising of timber for new sales and for replacing old sales as they are completed almost ceased during the depression years, and a large amount of this work is essential if the volume of business is to be continued under proper planning and with confidence in the determination of values.

In addition to timber that is sold for commercial purposes, dead timber is also furnished free in limited amounts to bona fide settlers, miners, residents, and prospectors for minerals and for firewood, fencing, building, mining, prospecting, and domestic purposes. Green timber is furnished free where the cutting will benefit the timber stand. In addition, sales at cost of administration, under special legal provision, are made to homestead settlers and farmers for material needed on the farm.

Tables showing volume and value of timber cut and number of transactions are given below:

National Forest Timber and Special Products Business

F. Y.	Amt. Timber Cut, Sales, Settlement, Trespass, and Land Exchange	Receipts from Sales, Settlement, Trespass and Special Products.	Value of National Forest timber cut under land exchange.
1933	473,922,000 ft. B.M.	\$ 782,808	\$ 238,868
1934	674,542,000 " "	1,522,356	212,546
1935	752,368,000 " "	1,731,355	217,112
1936	1,021,156,000 " "	2,203,237	470,585
1937	1,290,625,000 " "	2,924,471	448,603

Volume of timber on national forests (estimated), 552,000,000,000 board feet. Maximum allowable annual cut under sustained yield principles (estimated), 8,000,000,000 board feet.

Number of Special Products Sales and Commercial Sales Made on the National Forests

F. Y.	<u>Number of Commercial Sales</u>		Number of Special Products Sales
	Less than \$500 in value	Over \$500 in Value	
1933	14,294	68	- - -
1934	16,304	129	- - -
1935	17,380	140	1,312
1936	18,211	178	863
1937	18,873	263	1,213

(2) An increase of \$100,000 for control of white-pine blister rust.-- The white-pine blister rust has spread even more rapidly than was expected in the Inland Empire western white-pine region (northern Idaho, western Montana, and northeastern Washington). Many small trees have been killed and many more are sure to die. Some areas have already been damaged so badly that attempts at control, to prevent further infection, would not be worth while. Larger trees, with more twigs and limbs, are being killed more slowly, but, unless protection is given, they will surely be killed. Where control work has been done, further infection has been minor.

Also, the disease was found during 1937 in the Lassen and Trinity National Forests in California, as far as 125 miles south of the Oregon-California line. This is a faster spread into the sugar-pine region than had been expected. There are heavy infections on both sugar pines and Ribes bushes in some areas in the extreme northern part of California, but so far as is yet known infections further south are scattered. The present situation in California is similar to that which existed in the Inland Empire a few years ago, except that sugar pine is even more susceptible to this disease than is western white pine. Because the rust does not show itself on either of these pines for a year or more after infection, it is certain that the disease has attacked many more pines than can now be recognized, and the need for greater and more prompt protective effort is even more urgent than is indicated by the definite data at hand. In northern Idaho especially the next two summers must be considered as being critical for the first working of about 500,000 acres of national-forest white-pine land still untreated.

It has been possible to make only a start on the protection of the sugar pines in the national forests in California. In the Inland Empire about two thirds of the Government white-pine lands have been covered. The protective effort has been largely concentrated in the Inland Empire because the disease was widespread there and because white pine is the basis for the vitally important forest industries of the region. It is essential that the job be finished by extending protection to the remainder of the Government property. The increase in appropriation is requested for these reasons.

(3) A decrease of \$15,000 for Recreation and Land Use.--This is a transfer of \$15,000 to the appropriation "Salaries, Office of the Secretary", for use in the Office of Land Use Coordination.

(4) A decrease of \$76,796 for the construction of improvements other than roads and trails.

CHANGES IN LANGUAGE

The Budget estimates provide for a change in the title of this appropriation from "National Forest Administration" to "National Forest Protection and Management" for the reason that the latter title is more informative.

Another change involves the elimination of the following clauses from the item:

"compensation and traveling expenses of field personnel; the purchase of materials, supplies, and equipment; the"

The above language is regarded as superfluous in that there is no legislative prohibition on the expenditure of funds for the purposes indicated. Its elimination will, however, remove the requirement that all expenditures for personal services be confined to field personnel. In

the estimates for fiscal year 1939 six positions are included in the Departmental service -- two positions under the increase of \$100,000 for "Timber Use" and four positions by transfer from the field.

A clause has been inserted reading "including experimental forests" in order to make it possible to protect experimental areas which have not and probably will not be given national-forest status.

The following proviso has been added to authorize the protection and management of lands transferred to the Forest Service for administration:

"lands transferred by authority of the Secretary of Agriculture from the Resettlement Administration to the Forest Service, and lands transferred to the Forest Service under authority of the Bankhead-Jones Farm Tenant Act,"

WORK UNDER THIS APPROPRIATION

General.--This appropriation covers the field activities relating to the administration, protection, and development of the national forests except the special appropriations for the construction and maintenance of roads and trails under the Federal Highway Act and the Act authorizing the expenditure of ten percent of national-forest receipts for this purpose; the acquisition of additional forest lands under the Act of March 1, 1911; emergency expenditures for fire suppression; and expenditures from funds deposited to the credit of the Forest Service by counties, States, associations, and individuals for fire prevention and suppression, brush disposal, construction and maintenance of improvements, and reforestation.

While the description of the work done under this appropriation appears under the specific work projects which follow, a large percentage of the personnel paid from this appropriation are unit managers of ranger districts, national forests, and national-forest regions who participate to varying degrees in all the projects listed in these estimates. The need for these men and their general assistants is determined by the composite work load on the unit administered.

On June 30, 1937, the gross area of the national forests was 226,621,123 acres, and the net area, (excluding intermingled lands, which however, must be considered for protection purposes and some classes of improvement) 174,405,397 acres. The estimated figures for July 1, 1938, are, gross 227,000,000 acres, net 176,789,508 acres. The table which follows gives the cost per acre for the work projects under this appropriation as proposed for 1939:

<u>Name and Title of Project</u>	<u>Per acre costs</u> <u>based on gross area of</u> <u>227,000,000 acres</u>	<u>Per acre costs</u> <u>based on net area of</u> <u>176,789,508 acres</u>
1. Timber use.....	5.260 Mills	6.754 Mills
2. Forest fire prevention and preparedness.....	14.731 Mills	18.915 Mills
3. Forest fire suppression...	.935 Mills	1.201 Mills
4. Protection against tree insects.....	.508 Mills	.652 Mills
5. Control of blister rust and other tree diseases.....	2.224 Mills	2.856 Mills
6. Timber stand improvement..	.380 Mills	.488 Mills
7. Reforestation and revege- tation of denuded areas.	.803 Mills	1.031 Mills
8. Nurseries and planting stock.....	1.237 Mills	1.588 Mills
9. Grazing use.....	4.822 Mills	6.191 Mills
10. Recreation and land use...	2.309 Mills	2.965 Mills
11. Land classification, settle- ment and claims.....	.359 Mills	.462 Mills
12. Acquisition of land by direct purchase.....	.696 Mills	.894 Mills
13. Acquisition of land by exchange.....	.346 Mills	.445 Mills
14. Fish and game.....	1.576 Mills	2.024 Mills
15. Construction of truck and horse trails.....	1.765 Mills	2.266 Mills
16. Maintenance of truck and horse trails.....	.820 Mills	1.054 Mills
17. Construction of improve- ments other than roads and trails.....	3.528 Mills	4.530 Mills

<u>Name and Title of Project</u>	<u>Per acre costs</u>	<u>Per acre costs</u>
	<u>based on gross area of</u> <u>227,000,000 acres</u>	<u>based on net area of</u> <u>176,789,508 acres</u>
18. Maintenance of improve- ments other than roads and trails.....	6.716 Mills	8,623 Mills
19. General surveys and maps..	.792 Mills	1.017 Mills
20. Equipment and stores.....	.502 Mills	.645 Mills
21. Cooperation with other de- partments, bureaus and agencies.....	.370 Mills	.475 Mills
Total per acre costs for all projects based on gross area of 227,000,000 acres and net area of 176,789,508 acres...	50.679 Mills	65,076 Mills

1. Timber Use.--The Act of June 4, 1897, provides for the sale of timber from the national forests but also requires that a "continuous supply" be provided for. Thus sales are authorized on the sustained yield basis, with the forest treated as a renewing crop. In order to do this definite knowledge of the volume, species, and condition of the stands is necessary, disposal must be planned carefully so as to keep the forest growing more timber, and the sale must be capably administered. Also the specific timber offered for sale is appraised by competent men to obtain a fair value for the Government's property.

Cruising, the preparation of long-time plans for sustained yield operations, the determination of and marking of trees that are to be cut, the appraisal of timber offered, and the enforcement of the conditions of the contract of sale, including the determination of the volume cut and consequently of the amount to be paid, are all necessary for the accomplishment of the job as outlined in the law governing sales of national-forest timber.

In addition to timber that is sold for commercial purposes, dead timber is also furnished free in limited amounts to bona fide settlers, miners, residents, and prospectors for minerals and for firewood, fencing, building, mining, prospecting, and domestic purposes. Green timber is furnished free where the cutting will benefit the timber stand. In addition, sales at cost of administration, under special legal provision, are made to homestead settlers and farmers for material needed for the farm.

2. Forest Fire Prevention and Preparedness.--Practically every employee paid from this appropriation contributes in some degree to this project. The Act of June 4, 1897, originally provided for the protection of the national forests from fire. Appropriations were small, however,

and for years very little was done beyond the efforts of the permanent force of employees. The disastrous forest-fire year of 1910 brought about a recognition of the size of the problem, and the present system of organized fire control dates back to that year.

The fire-prevention activity is carried on by constant educational campaigns through the use of all available media--news items, radio programs, motion pictures, exhibits, lectures, admonitory signs, and distribution of pamphlets and other literature; and also by apprehending and prosecuting persons responsible for starting fires, by requiring visitors to equip themselves with fire-fighting tools, by the partial or entire closing of the national forests to public travel during dangerous periods, by "fire-proofing" campgrounds, by the concentration of campers on public campgrounds, by prohibiting smoking and camping at other than established campgrounds, by registering and cautioning tourists, and by clearing road rights-of-way.

The task of controlling forest fires is largely one of advance systematized preparation. As the fire-control problem is one of high priority, practically all the members of the permanent organization are available for fire duty. In addition, approximately 4,000 temporary men designated "guards" are employed during the fire season and are stationed at strategic points through the forests where they act as lookouts, "smoke-chasers", or patrolmen.

The lookouts are stationed at points which overlook large areas of forest land. These men are tied in by telephone to ranger district headquarters. They watch for fires and notify district rangers of the location of the fires. Smokechasers are stationed on roads or trails and are also tied in by telephone to ranger district headquarters, and when fires are reported the smokechasers are dispatched to the fire. Patrolmen both detect and suppress the fires which occur along their patrol routes.

Before the fire season opens complete plans are prepared, which include maps showing transportation and communication systems, areas visible from lookout stations, areas of greatest fire hazard, etc. Organization charts are also prepared showing the location of all available man power, including permanent and temporary employees, road and other construction crews, settlers and ranchers, sawmill and logging camp operators, etc. Similar information is included for the tools, equipment, and food supplies which may be needed if large crews are required for suppressing fires. Cooperative agreements are entered into with all agencies in the vicinity of the national forest which may be of assistance in controlling forest fires. Men are selected and systematically trained at pre-season training camps whenever possible, and detailed written instructions are prepared for each member of the force.

3. Forest Fire Suppression.-- Fire is an ever-present danger in some portion of the forested area of the country. The great size of the forests in comparison with the relatively small patrolling force, the inaccessibility of wilderness areas, the dry air, light rainfall, the prevalence of lightning in the mountains, and the constant use of fire in

the daily life of the people and in industries combine greatly to increase the hazard.

Complete fire exclusion in a forest is rarely attainable, because fires originate from natural as well as human causes. The established protection policy calls for fast, energetic, and thorough suppression of all fires in all locations during possibly dangerous fire weather. The objective demands such planning and execution of attack as will secure control within the first work period or before 10 o'clock of the next morning.

Upon receipt of the report of a fire the regular organization functions immediately and men are dispatched to the scene. Though each fire-suppression job is an individual problem, there are certain basic principles of attack. The first requirement is usually to learn the size of the fire and determine its probable progress by noting topography, type of cover, wind conditions, dryness of litter, natural firebreaks, etc. Next comes the job of building the fire line where the best judgment of the officers in charge dictates. The line is patrolled to prevent the fire from jumping it. During the construction of the control line and after it has been completed and the fire checked, continual patrol is necessary to prevent it from breaking out again, jumping the line, and going on a rampage. No fire is left until it is completely out.

4. Protection Against Tree Insects.--- Tree insects are always present in the natural forest. Under normal conditions they are kept in check by their natural enemies. Ever since the Forest Service has had jurisdiction over the national forests close cooperative contacts have been had with the Bureau of Entomology and Plant Quarantine, the agency to which the Forest Service looks for its technical advice in the control of forest insects.

The purpose of insect control is to catch in the early stage infestations which are becoming epidemic in an endeavor to prevent widespread infestations. Much of the timber in the national forests is overripe and is therefore more subject to insect attack than the thrifty faster-growing stands.

Insects are controlled in numerous ways, control procedure varying with the type of insect and its life cycle. Bark beetles, which are the cause of the greatest timber losses, are controlled by destroying the immature beetles before they leave the host tree, and this is usually accomplished by felling the trees and burning the logs, felling the trees and peeling and burning the bark, or by spraying with oil and scorching thoroughly the standing tree. Defoliating insects are controlled by spraying the foliage with poison.

5. Control of Blister Rust and Other Tree Diseases.--- As in the case of insects, disease is practically always present to some degree in the natural forest. External influences such as man, wind, and fire have greatly increased the hazards of the forest from tree diseases. In addition to the native species of fungi at work in our forests, there have been a number of very destructive fungi introduced from abroad. The most outstanding examples of such fungi are the chestnut blight, the Dutch elm

disease, and the white-pine blister rust. The chestnut blight became so thoroughly established in our eastern forests before being discovered that control proved to be impossible and as a result the American chestnut has almost entirely disappeared from our forests. The white-pine blister rust gave promise of repeating the history of the chestnut but adequate control measures have been developed and, if the finances can be provided, it is definitely known that white pine can be protected from this disease. The size of the job of protecting white pine from blister rust is pretty definitely known, and plans have been made which, if carried out, will insure the growing of white pine on its best natural sites.

The Forest Service looks to the Bureau of Plant Industry and the Bureau of Entomology and Plant Quarantine for technical advice in the control of tree diseases. Very close cooperative relationships are being maintained with these bureaus. In blister-rust control on national-forest lands the Bureau of Entomology and Plant Quarantine provides the technical direction and the Forest Service handles the control operations. On lands outside the national forests the Bureau of Entomology and Plant Quarantine directs both the control operations and technical supervision. It is important that the two bureaus keep their programs in proper balance because of the intermingling of private and national-forest lands. This has been accomplished very satisfactorily through the excellent cooperative arrangement which has existed between them.

The purpose of disease control is to catch in the early stages infestations which are becoming epidemic in an endeavor to prevent widespread infestations.

The treatment necessary to control a disease varies with the characteristics of that particular disease. Blister rust is controlled by eliminating the alternate host species--currants and gooseberries--from the vicinity of the pine. Since the spores from the infected pine can not directly infest other pines, but must first pass through a fruiting stage on the currants and gooseberries, the removal of these shrubs protects the pine from attack.

Area Given Protection from the White-Pine Blister Rust Disease

<u>Period</u>	<u>Idaho, Eastern Wash.,</u>		<u>Oregon-California</u>
	<u>West. Montana</u>		
Up to and including 1933	200,000	acres	
Calendar year 1934	408,000	"	119,424 acres
" " 1935	138,000	"	49,000 "
" " 1936	140,000	"	74,800 "
Totals	386,000	acres	243,224 acres

There are 1,392,000 acres of the western white-pine type of northern Idaho, eastern Washington, and western Montana and 1,108,000 acres of the sugar-pine type in Oregon and California needing protection.

6. Timber-Stand Improvement.-- Timber-stand improvement represents a type of work highly essential if intensive forest management is to be

practiced on our national-forest properties. Its object is to improve the conditions for growth in our various types of stands. Timber-stand improvement is accomplished through practices known as cleaning, thinning, and sanitation cutting, the object being to favor the thrifty specimens of the better species by releasing the selected crop trees from crown and root competition. This work is performed by carefully trained organized crews, properly equipped, proceeding through the woods in line formation, each man selecting his crop tree and releasing it from competition.

At the present time charges to this activity represent largely general and direct supervision of work performed by crews paid from emergency funds.

7. Reforestation and Revegetation of Denuded Areas.--- This activity is largely on a special project basis, although general supervision is exercised by rangers and supervisors over the work of temporary employees. Up to the time the national forests were created fires ran rampant and large areas of forest land were devastated. There have also been bad conflagrations since the creation of the national forests, particularly on areas where previous fires had only partially killed the timber. Under our acquisition program millions of acres have been included within the national forests, particularly in the East. A good portion of these lands had been denuded by destructive logging and fire before being a part of the national forests. Our present reforestation program provides for the planting of 4 million acres. The objective in reforesting these devastated lands is to preserve the watersheds of navigable streams, to restore municipal and domestic water supplies, to prevent and control erosion, and to grow crops of commercial timber. Planting is done by trained crews of men operating either singly or in pairs, the trees being planted in rows with a spacing between trees of from 4 to 8 feet. The period during which planting can be done is restricted to spring and fall seasons.

Funds from this appropriation are used for field planting only where it is impracticable to perform the work with CCC or other emergency labor.

Area Planted and Sown on the National Forests

<u>Calendar Year</u>	<u>Acreage</u>
1932	24,755
1933	69,215
1934	74,716
1935	140,724
1936	223,075

8. Nurseries and Planting Stock.--- This activity is conducted mainly through specialists and crews of temporary nursery workers. The first Forest Service effort in growing trees for reforestation work began in small nurseries largely of an experimental nature, most of the work being handled by the permanent employees. Under present plans the annual nursery capacity has been very greatly enlarged so that at the present time the Forest Service is equipped to supply nearly 255 million trees annually. In order to furnish stock for the planting program it is

necessary to grow the trees in the nurseries from one to four years, depending on the species to be used and the sites on which the planting will be done. The size of the nursery depends largely on whether seedlings or transplant stock will be grown. In the latter case a much greater area is required. Nurseries are completely equipped with the necessary buildings for carrying on the nursery activities, consisting of workshops, implement houses, bunkhouses, and mess quarters. Water must be made available to the area and is usually so piped as to make possible an overhead spraying system. Men must be employed in each nursery from early spring to late fall for preparing the soil, sowing, watering, and weeding the seed beds, transplanting, and lifting and packing the trees for field planting.

Nurseries operated by the Forest Service for the production of forest-tree seedlings and transplants primarily for planting national-forest land are listed below:

Name	Approved Annual Output*
Susanville, California.....	1,000,000
Wind River, Oregon.....	3,500,000
Savenac, Montana.....	10,000,000
McCall, Idaho.....	1,000,000
Tony Grove, Utah.....	2,000,000
Pole Mountain, Wyoming.....	280,000
Bessey, Nebraska.....	6,000,000
Monument, Colorado.....	5,500,000
Coconino, Arizona.....	500,000
Superior, Minnesota.....	23,000
Glenwood, New Mexico.....	20,000
Cloudcroft, New Mexico.....	5,000
Towner, South Dakota.....	3,500,000
Lydick)	
Cass Lake) Minnesota.....	9,500,000
Eveleth, Minnesota.....	11,500,000
Knife River, Minnesota.....	5,000,000
Hayward, Wisconsin.....	14,000,000
Butternut, Wisconsin.....	14,000,000
Hugo Sauer, Wisconsin.....	12,500,000
Watersmeet, Michigan.....	14,000,000
Wyman, Michigan.....	16,000,000
Chittenden, Michigan.....	22,000,000
Beal, Michigan.....	10,000,000
Chillicothe, Ohio.....	8,500,000
Vallonia, Indiana.....	9,000,000
Keosauqua, Iowa.....	6,000,000
Licking, Missouri.....	10,250,000
Ozark, Arkansas.....	3,000,000
R. Y. Stuart, Louisiana.....	26,000,000
W. W. Ashe, Mississippi.....	26,000,000
Parsons, West Virginia.....	5,000,000
All nurseries.....	255,578,000

*Based on need for planting in the area served by each nursery and on available funds. Many nurseries are operating temporarily above or below approved annual output. The whole program is being adjusted toward the figures shown in this column.

9. Grazing Use.-- Work carried on under this activity is both administrative and technical. Administrative activities have to do with the coordination of domestic livestock forage uses with wildlife, recreation, timber production and protection, and other uses of the national forests. All livestock grazed are covered by formal permit excepting the few head permitted free to settlers, miners, or prospectors or those used in connection with permitted operations. The latter permits sometimes involve relatively more work than the larger, more formal transactions and sometimes require written permits. Some 12,000,000 pay and free stock, which include the season's natural increase, were grazed in 1936.

Other work consists of the handling of grazing applications for pay permits, stock counting, inspections to determine range readiness and to see that management on different units of range is installed and carried out during the grazing season, studies of these uses in relation to local capacities, supervision of improvement construction such as fences, water development, stock bridges, driveways, and stock trails, poison-plant eradication, handling of complaints and appeals, meetings with stockmen and advisory boards, preparation of annual and periodic reports, and the development and current revision of unit management plans. New trespass cases during 1936 numbered 219; over 3,360,000 acres were covered by intensive range surveys; poisonous plants were dug on 3,086 acres; 23 new livestock organizations were perfected, bringing the number to 763; and assistance was given on more than 500,000 acres for rodent control.

10. Recreation and Land Use.-- Work carried on under this activity includes the planning, control, and administration of all forms of occupancy of national-forest lands except only those relating to the use of the forage and timber resources. General surveys of entire national forests are made in order to determine and classify areas suited to each specific use. Because of conflicting demands of various types of uses, careful surveys and planning for each are necessary. The areas that are classified as being suited to recreational use require further surveys and plans in order to determine the specific type of recreational use to which they are best adapted. Careful planning is necessary because the designation of areas as special-use areas, suited for resorts, summer homes, clubs, etc., for public campgrounds, or for primitive areas, constitute, in many instances, a permanent dedication to that use.

Within each specific area it is necessary to determine whether the entire area shall be dedicated to special use and become available for summer homes, clubs, or resorts, or a combination of two or more of these uses, or whether the entire area shall be dedicated to public use and developed as a public campground, or whether it shall be kept primitive. It might be finally decided that a specific area should be developed so that a portion would serve as a campground, another portion as a summer hotel or resort site, and still another portion as sites for summer homes. All these decisions must be based upon surveys and plans.

On each special-use area it is necessary to survey out each lot, locate each road and service drive, and set stakes on each lot for building locations. On the public-use areas it is necessary to plan the entrance drives, camping areas, campground facilities, parking areas, playgrounds, beaches, etc.

The work involved in administering the special use business of the Forest Service includes negotiations with prospective permittees, showing them the available sites, issuing permits, the drawing up of minimum requirements, plans, and specifications for each special use area; review and approval of improvement plans of new permittees, according to the area in which the use is located; making up permits, preparation of letters of transmittal for handling the fees, and inspection of areas for compliance with clauses made a part of the contract or special-use permit.

On public campgrounds, used free of charge by the public, policing is required to assure proper use and maximum utility by the public. On a majority of the public campgrounds this duty is assigned to a regular or temporary seasonal employee of the Forest Service in conjunction with their other duties. On the larger campgrounds it is necessary to assign men as caretakers for the entire camping season. On many of these areas policing, garbage-disposal provisions, and furnishing firewood requires the services of more than one man.

Additional work carried on under this activity includes the landscaping of ranger stations and other administrative buildings, checking forest road locations prior to construction with particular regard for the preservation of scenic and recreational values, and checking designs of all structures erected in the national forests from the viewpoint that their appearance will be appropriate in a forest setting.

11. Land Classification, Settlement, and Claims.--- The lands reserved for national-forest purposes from the public domain are subject to the provisions of the Forest Homestead Act of June 11, 1906, and the Classification Act of August 10, 1912. These Acts require the determination, classification, and listing of all lands chiefly valuable for agricultural purposes and not needed for more important public purposes. The original work of classification was completed a number of years ago, but need for revision, amendments, and readjustments arises intermittently and requires administrative action. Lands listed and entered under these laws require periodic supervision, and, preliminary to application for patent, reports must be made for the Department of the Interior. The national-forest lands reserved from the public domain also are subject to the general mining laws of the United States and to the public-land laws relating to rights-of-way, easements, etc., in which cases the Forest Service acts as the field representative of the Department of the Interior, preparing the necessary reports and conducting the required supervision of the development work. There are tens of thousands of mining locations within the national forests and scores of applications for easements, rights-of-way, etc., which require attention each year.

The principal purposes of this activity are to insure (a) that the lands chiefly valuable for agricultural purposes are properly classified and made available for entry, (b) that all the requirements of the public-land laws are satisfactorily met, and (c) that use and occupancy under such public-land laws does not result in illegal or unjustified conflict with the protection and use of the national-forest lands and the public interests inherent therein. The activity entails the use of the time of personnel on the work of field examination, the determination of fact, the preparation of reports, the presentation of evidence in cases of violation

of legal limitations, and administrative routine in relation thereto. Proper control of mineral locations requires in itself the permanent employment of two technically qualified mineral examiners in addition to the part-time service of numerous forest rangers and other members of the field organization.

12. Acquisition of Land by Direct Purchase.--- This project includes only the time and expenses of employees paid from this appropriation while engaged on this activity, generally in a supervisory capacity. A special appropriation or emergency allotment for the purchase of land has been made for each year since 1911. A separate appropriation of \$3,000,000 was provided for the acquisition of land in the Agricultural Appropriation Act for 1938, and an estimate of \$1,000,000 is included in the Budget for 1939. A further description of this activity will be found under that heading.

13. Acquisition of Land by Exchange.--- The national forests contain approximately 25,000,000 acres of land in ownerships other than Federal, these consisting of grants to States and to railroads, various types of entry under the general land laws of the United States, and areas patented under the Forest Homestead Act of June 11, 1906. These lands are widely interspersed among the national-forest lands and frequently complicate and increase the cost of protecting, managing, and utilizing the national-forest properties. Outside but contiguous to the national-forest lands are other forest lands which are integral parts of the same natural units of forest management, and in a number of instances Congress has authorized the acquisition of such lands by exchange. To date Congress has passed a total of 59 laws permitting acquisition of privately-owned forest lands suitable for national-forest purposes by grants in exchange for not to exceed equal values of national-forest land and/or stumpage in the same State.

The primary purpose of acquiring forest lands by exchange is to bring natural units of forest management, largely in public ownership, under unified plans or programs of management and use, to minimize the creation or maintenance on private lands of conditions of abnormal risk or hazard, and to reduce the high cost of administration created by the occurrence of such private lands upon the Federal lands. The initiation of measures by which the natural productivity and social values of the privately-owned lands may be conserved is also an important requirement.

The conduct of this activity involves the receipt of applications for exchange; the examination, mapping, cruising, and appraisal of the offered lands to determine the maximum values which may be allowed therefor; the comparable examination, mapping, cruising, and appraisal where necessary of the Government lands to be selected in exchange, or of the national-forest stumpage to be granted for the private land; the negotiation of the terms of exchange with the owners of the private land; the preparation of the necessary reports for review by the various executive officers and by the Secretaries of Agriculture and the Interior or their staffs; and the subsequent transaction of the successive routine steps necessary to consummate the exchanges and deliver the national-forest lands or stumpage. During the fiscal year 1937 there were submitted to the Secretary of Agriculture, for approval and transmittal to the Secretary of the Interior, a total of 117 cases involving an aggregate of 222,230 acres of private

lands, valued at \$1,355,080, selected areas containing 84,026 acres and valued at \$310,578 and selected national-forest stumpage valued at \$903,300; in relation to which it was necessary to perform all the functions above cited; the cases in which part or all of the functions were performed during the preceding fiscal year being offset by the other cases requiring similar action which were not submitted until after the close of the year.

To date the lands acquired through exchange by the United States have supported about **twice** as much stumpage of merchantable character as has been granted for such lands in the form of stumpage. The stumpage acquired will in time become salable and yield receipts to the Treasury. To acquire such private lands and stumpage it is necessary to grant more accessible national-forest stumpage, some of it within the limits of going timber sales. While the stumpage so granted would otherwise be salable for cash, some of it would not normally be salable for a considerable future period, because the parties to the exchange are the only ones that could use such stumpage in the future, and they would not be willing to acquire it by cash purchase, although they are willing to acquire it by exchange.

14. Fish and Game Protection.--- Work under this head consists of cooperation with various Federal and State agencies, sportsmen, and others, cooperation in the enforcement of State and Federal game laws, examination of licenses and their issuance in remote places where the public cannot be otherwise effectively served, the giving of information to the public about game laws and wildlife, the requisition and planting of large numbers of fish and the development of fish planting plans, posting game refuges and other protected areas, transplanting beaver, assistance in transplanting game birds and in predatory-animal control, the making of game estimates and the collection of statistical information on game species and on game animals killed by man and by predators, the relation in season to game laws and bag limits, inspection and selection of sites for holding and rearing ponds, development of plans for restocking of lakes and streams, supervision of lake construction and stream improvements, game-bird surveys with special observations on species threatened with extermination, winter observations on range adequacy for big game and condition of animals, studies of sex ratios, forage requirements, assistance in emergency feeding during critical periods, the study and correlation of wildlife and domestic stock uses, overpopulations, and the development of game-management plans.

At the close of 1936 there are some 1,600,000 big-game animals on the national forests, representing a net increase of some 140 percent since 1924. Fur-bearers are estimated at about the same number. Game birds are also important. The fishing resource is indicated by about 70,000 miles of trout streams and many thousands of natural and artificial bodies of water suitable for game fish, in which forest officers planted from State and Federal hatcheries 401-1/4 millions of fish in 1933 to 1935. There were constructed during the same period 59 lakes and ponds with a total acreage of 5,303.7. Stream improvement facilities numbered 31,084 for the same period. The number of fish planted by forest officers in 1936 totaled 131,000,000. About 1,500 regular forest officers participate in wildlife activities pertinent to their local jurisdictions.

15. Construction of Truck and Horse Trails.--- Most of the national forests are located in sparsely settled sections of the country and were largely undeveloped and inaccessible when acquired. The major costs of the work on truck and horse trails are borne under the appropriations "Roads and Trails for States, National Forest Fund" and "Forest Roads and Trails". The work under this specific project includes the time and expenses of the employees paid from the appropriation "National Forest Protection and Management" and is concerned with the planning and supervision of the construction work, the payment of accounts, maintenance of records, purchase of supplies and equipment, and similar service activities. The special road appropriations provide for the direct costs of labor, materials, supplies, and direct supervision.

16. Maintenance of Truck and Horse Trails.--- The direct costs of maintenance are borne by the Forest Road and Trails appropriations. However, a great deal of time is necessarily spent by the regular personnel in planning, coordinating this project with other activities, supervising the work, paying accounts, hiring personnel, purchasing supplies, and in similar service functions. The scheduling of this work is very important, inasmuch as all roads must be opened in advance of the fire season.

17. Construction of Improvements Other Than Roads and Trails.--- Most of the national forests are located in the mountainous regions of the country, largely undeveloped and inaccessible. To facilitate their administration and protection it is necessary to equip them with various classes of improvements.

Telephone lines are needed for fire control in localities where commercial systems are not available; lookout cabins on mountain peaks to house men and instruments properly located to discover lightning and other fires and to transmit the alarm; lookout towers where the topography does not provide a natural elevation sharp enough to command the necessary view; dwellings, barns, and other structures necessary to provide quarters for men and animals who must be stationed remote from any settlement or rentable quarters; simple office structures for housing records and transacting business required in administrative or fire-control work; fences to prevent the trespass of unpermitted stock or to control the drift of permitted stock in order to secure the best utilization of the national-forest ranges; water improvements in the form of developed springs and wells, pipe lines, and other works required at ranger and other stations, for watering livestock on the forest ranges, or for public campgrounds; and other campground improvements designed to protect the forests, maintain sanitary conditions, and facilitate public recreational enjoyment of the forests by providing simple structures, etc.

There are also required certain improvements of a nonstructural nature, such as permanent firebreaks and lanes placed in strategic locations to facilitate holding fires that escape from the initial efforts to control them; the clearing of debris and fallen timber along roadsides to reduce the fire hazard; the improvement and cleaning of fishing streams; and soil-erosion work.

Each national-forest region has a plan for its improvement needs. As funds are made available, those of highest priority are constructed along standardized specifications and simple practical lines.

18. Maintenance of Improvements Other Than Roads and Trails.--- This project includes the repair and maintenance of all forms of improvements except roads and trails. The thousands of miles of telephone lines are thoroughly gone over; fallen trees are removed; broken wires are spliced; insulators are replaced, and instruments are checked. The wear and tear on buildings and lookout towers in forested country is great. Lightning insulation is repaired, windows are replaced, and guying, painting, roofing, etc., are attended to. Fences are put into shape by post replacement, guying, and wire repair. Springs, troughs, tanks, basins, and piping are cleaned and repaired. Public campgrounds are cleaned up and put in shape and fire preventive safeguards are freshly overhauled.

19. General Surveys and Maps.--- A greater and more intensive utilization of the older forests, the addition of new forest areas, or changes in boundaries of forests for purchase units require markings of property lines, surveys and maps for laying out transportation, detection and communication systems, special-use and recreation areas, nurseries, administrative stations, lookout towers, water-resource utilization, type mapping, and property ownership. Corrections of existing maps must be secured to make these suitable for Forest Service administration and protection. Some 70 forest maps must be corrected, traced, lithographed, and printed. More accurate locations of topographic features are required for the proper protection and administration of the forests. The Forest Service is not engaged in general quadrangle mapping like that of the Geological Survey, in township and sectional surveys like the work of the General Land Office, or upon control surveys similar to those of the Coast and Geodetic Survey. However, where any topographic, cadastral, or control work is done the standards used permit adoption and incorporation with the later work of the other agencies.

20. Equipment and Stores.--- This account has been set up to carry stores and equipment remaining in stock at the end of the fiscal year, which has not been charged to another project.

21. Cooperation with Other Departments, Bureaus, and Agencies.--- The Forest Service cooperates with other Government departments, bureaus, and agencies on activities not primarily of benefit or producing benefits to national-forest resources. Often the Forest Service is better qualified to carry on such work because of the technical experience of its personnel or because the geographic distribution of its organizations may enable it to better handle the work from the broad viewpoint of Government economy. This work is done in accordance with the standards established for the various jobs. Illustrative of this work project is the cooperation with the Bureau of the Census in their agricultural and lumber censuses; cooperation with the National Park Service, the Bureau of Indian Affairs, and the War Department regarding forestry problems on their lands; cooperation with the Department of Justice and the Treasury Department in law enforcement where national-forest lands are involved, etc.

(d) WATER RIGHTS

Appropriation, 1938.....\$10,000
 Budget Estimate, 1939..... 10,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Investigation and establishment of water rights.....	\$8,992	\$10,000	\$10,000
Unobligated balance.....	1,008	- - -	- - -
Total appropriation.....	10,000	10,000	10,000

WORK UNDER THIS APPROPRIATION

The State of Arizona has instituted suit against the other States embracing the drainage of the Colorado River, which may result in the permanent adjudication and decree of all rights to the use of waters draining into the Colorado River and conceivably deprive the United States of water rights vitally indispensable to the proper protection, management, and use of millions of acres of national-forest lands, or might necessitate expensive litigation to establish such rights. The \$10,000 appropriation provided by this item is for the study and determination of all rights essential to the proper use of the national forests with a view to permanently establishing such rights by filings and appropriations under State laws or by other appropriate means. The appropriation should be continued until the water-right situation in the Colorado River drainage is clarified.

(e) FIGHTING FOREST FIRES

Appropriation, 1938. \$100,000
 Budget Estimate, 1939. 100,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase or decrease
1. Fire suppression.....	\$1,833,538	\$33,000	\$67,000	+\$34,000
2. Protection of lands, railroad forfeiture units.....	82,983	34,000	- - -	- 34,000
3. Protection of unappropriated public forest lands.....	- - -	33,000	33,000	- - -
Unobligated balance.....	228,479	- - -	- - -	- - -
Total appropriation.....	(a) 2,145,000	(b) 100,000	100,000	- - -

(a) Includes \$2,045,000 forest-fire deficiency provided by First Deficiency Appropriation Act, 1937.

(b) Regular appropriation; does not include 1938 fire fighting deficiency.

INCREASES OR DECREASES

There is no change in the total of this appropriation in 1939. However, a change in language, eliminating the authorization for the protection of the Oregon and California Railroad and Coos Bay Wagon Road lands, has resulted in a compensating increase and decrease of \$34,000. Under ordinary circumstances, the elimination of a work project from an appropriation would result in a decrease in the total of the appropriation. However, in this case the amount of the appropriation has long been recognized as a nominal one, owing to the futility of attempting to predict the seriousness of a forest fire-fighting season eighteen months in advance, and a reduction in the total is not considered advisable. In reality, the appropriation constitutes an authorization to incur a deficiency to protect Government property. At the same time, the appropriation should not be reduced below \$100,000, because this amount is needed to meet fire-fighting contingencies in the spring months of the fiscal year preceding the appropriation year. A description of the financial procedure followed in managing this appropriation in a bad fire year explains why a sizeable regular appropriation is necessary.

At the beginning of the fiscal year expenditures are made from the Fighting Forest Fires appropriation for emergency fire fighting as long as the regular appropriation of \$100,000 lasts. From that point on to the end of the "summer" fire season funds are borrowed from other appropriations to meet these emergency expenditures. In December a deficiency

estimate is prepared which shows actual obligations for the period July 1 to December 31 and estimated obligations for the period January 1 to June 30 of the ensuing calendar year. A deficiency appropriation is usually passed in January or February providing funds with which to reimburse the appropriation from which loans were made for the "summer" season and establishing a fund for fire-fighting expenditures in the "spring" season. The estimate for the last six months of the fiscal year (the "spring" season) is based upon averages for that period. Unfortunately "spring" fire seasons do not conform to averages. Expenditures during the last half of the fiscal year have varied from as low as \$68,012 to a maximum of \$321,623. The heavy expenditures during this six months' period invariably occur late in June, making it impracticable to obtain a deficiency appropriation prior to the close of the fiscal year when the total amount available for this purpose has been exhausted. To meet such situations as this, a proviso was inserted in this item many years ago, authorizing the Forest Service to draw on the appropriation for the ensuing fiscal year. It has been necessary to do this only in exceptionally serious years - the last time in the fiscal year 1931 when a total of \$321,623 was spent in the spring season.

(1) An increase of \$34,000 for fire suppression.--As shown in the foregoing, both the \$33,000 which appears in the 1938 column of the project statement and the \$67,000 in the 1939 column are inadequate. The increase of \$34,000 in this project is dictated entirely by the necessity for keeping the total of the appropriation at \$100,000, for the reasons stated in the foregoing paragraph.

(2) A decrease of \$34,000 for the protection of lands, railroad forfeiture suits.--This reduction is brought about by the elimination of the proviso authorizing the protection of the Oregon and California Railroad and Coos Bay Wagon Road lands, as explained below under "Change in Language".

CHANGE IN LANGUAGE

The following proviso has been eliminated from this item because of the passage of the Act of August 28, 1937 (Public No. 405, 75th Congress), which authorizes the Secretary of the Interior to set up an organization for the administration of the lands referred to therein:

"and for the establishment and maintenance of a patrol to prevent trespass and to guard against and check fires upon the lands revested in the United States by the Act approved June 9, 1916 (39 Stat., p.218), and the lands known as the Coos Bay Wagon Road lands involved in the case of Southern Oregon Company against United States (numbered 2711), in the Circuit Court of Appeals of the Ninth Circuit."

WORK UNDER THIS APPROPRIATION

1. Fire Suppression.--This project covers emergency fire-control expenditures in connection with the suppression of forest fires on the national forests. Administrative restrictions placed upon the use of these funds by the Forest Service provide that expenditures shall not be made therefrom until forest fires have actually started. An exception is made to this rule, however, when fire conditions become so critical that the regular protective organization, which is financed from the appropriation "National Forest Protection and Management," is unable to cope with the situation and when, therefore, the temporary employment of additional guards clearly will reduce expenditures for fire fighting.

Expenditures are made for the employment of fire fighters and their transportation and for equipment needed on going fires when not available in stocks of equipment previously purchased. Expenditures are made for the travel expenses of forest guards when going to or returning from fires and for the travel expenses of regular employees of the Forest Service when the travel extends beyond the boundaries of the units to which they are regularly assigned or when the activities to which men are regularly assigned do not include fire fighting.

2. Protection of Lands, Railroad Forfeiture Suits.--This project, which will be discontinued on June 30, 1938 (see explanation under "Change in Language"), includes the prevention of trespass and fire prevention and suppression on the Oregon and California Railroad and Coos Bay Wagon Road lands, situated almost entirely in the State of Oregon. These lands are intermingled with or adjacent to national forests. The protection of lands within the boundaries of national forests has been handled by the fire-control organization of the Forest Service. Lands outside the boundaries of national forests have been protected through cooperative agreements with timber protective associations. Under the latter arrangement the Federal lands were assessed the same rate per acre as the private lands within the boundaries of the timber protective association.

3. Protection of Unappropriated Public Forest Lands.--Unappropriated public forest lands are widely scattered throughout the entire West. In many cases protective associations, organized to protect privately owned lands, were compelled, prior to fiscal year 1938, to protect the public forest lands intermingled with the private lands. Under cooperative arrangements which have been worked out between the Forest Service and the timber protective associations, the Federal Government will now bear its fair share of the cost of protecting these public lands. The accounts of the timber protective associations will be audited by the Forest Service and the per-acre cost of protecting the public forest land will be based upon a total figure from which all improvement and development expenses have been eliminated.

In addition to the lands within the boundaries of timber protective associations, there are large areas of unappropriated public forest lands which should be protected from fire. However, these lands are widely scattered and for that reason protection costs would be high. No expenditures are contemplated for the protection of lands outside the boundaries of protective associations in the fiscal year 1939.

(f) PRIVATE FORESTRY COOPERATION

Appropriation Act, 1938.	- - -
Budget Estimate, 1939.	<u>\$200,000</u>
Increase	<u>200,000</u>

PROJECT STATEMENT

Project	1937	1938 (Estimated)	1939 (Estimated)	Increase
Cooperation with timberland owners.....	- - -	- - -	\$200,000	+ \$200,000(1)

INCREASE

(1) A new item of \$200,000 for the development of private forestry cooperation is included in the Budget estimates for 1939.--For several decades the forest lands of the United States in private ownership have been subjected to careless and wasteful handling and the timber crop has been harvested without thought of the future. The actual and potential economic loss has been staggering.

The proper handling of the Nation's forests directly affects large numbers of the country's population. The 400,000,000 acres of privately owned forest lands support almost the entire lumber and pulp industries of the United States. Upon the stabilization and continuous production of these industries depend the welfare of more than a million workers who are directly connected with wood-using industries. These private forest lands, situated for the most part in important watersheds, also have a far-reaching influence in controlling floods and soil erosion throughout the country.

The public, therefore, holds a vital stake in this 80 percent of the Nation's forest land which lies in private ownership. Wasteful logging and unrestrained cutting mean additional tax-delinquent land, economic disturbances through forced unemployment because of lack of raw materials, involuntary liquidation of investments with terrific losses, a constantly increasing flood menace and loss of soil through erosion, decreased wild-life and recreational facilities, and a constantly decreasing tax base for local taxing communities which will inevitably result in bankrupt townships and counties and defaulted bond issues. Continuance of such uncontrolled practices is detrimental to the public interest.

The cream of the timber crop of the United States has already been skimmed off. The great hardwood forests of the Appalachian and Central States, the vast pineries of the Lake States area, and the once tremendous areas of saw-timber in the Southern States have all been depleted

through logging, fires, and insects. Today nearly half of the saw-timber remaining in this country lies in Oregon and Washington. The pulp and paper industry, attracted by local labor conditions and currently available supplies of second-growth pulpwood, has in the past eighteen months thrown an investment of approximately \$100,000,000 into the Southern fields in new pulp mills and related holdings. The economic prosperity of the South will be directly affected by the plan of management to be followed in the harvesting and utilization of this crop of pulpwood, and it is of paramount importance that there be no delay in setting up essential safeguards to protect the public welfare.

Too little attention has been given to this vast area of privately-owned land, and practically no Government appropriations have been made, except for limited fire protection. The public interest requires the perpetuation of our forest resource, but complete public acquisition would involve excessive expenditures. The apparent solution lies in the retention of forest lands to a very considerable degree in private ownership for timber production, with the adoption of forest-management plans which would permit such lands to remain continuously productive.

The Forest Service, as the acknowledged leader in such work, is expected by the public and the industry to cooperate and assist in the promulgation and application of such plans on the commercially valuable forest land, and to secure the data upon which such plans are necessarily based. The appropriation is desired to permit the furnishing of this service, which is so vitally essential to the stabilization of industry and employment, with its consequent bearing upon the public welfare.

WORK UNDER THIS APPROPRIATION

Broadly speaking, the work under this item is for the purpose of securing improved forestry practices on privately-owned industrial forest lands for eventual application of sustained-production and sustained-yield management to widespread areas, providing economic and social stability for forest communities and industries. Working relations will be established with forest producing agencies as a basis for working out, first of all, the most critical problems in the various important forest regions.

Private forestry problems will be attacked by various means, including (1) studies of individual private and joint private-public ownerships to determine the best practicable methods and plans of forest management; (2) cooperation with organized groups of forest industries; (3) examination and studies of private forestry operations with a view to analyzing the factors contributing to success or failure of the operation; (4) extensive analyses of the forest situation in political units, with recommendations for procedure; and (5) exploration of legislation, existing and needed, to stabilize and facilitate private forestry practice.

Forest Research

(g) FOREST MANAGEMENT INVESTIGATIONS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938. . .	\$638,403	\$89,602	\$728,005
Budget Estimate, 1939. . .	638,403	- - -	638,403
Net change.	<u>- - -</u>	<u>-89,602</u>	<u>-89,602</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. Silvicultural investigations:				
Regular funds.....	\$288,290	\$296,359	\$296,359	- - -
Emergency relief funds.....	293,253	59,681	- - -	-\$59,681
Total.....	581,543	356,040	296,359	- 59,681
2. Mensuration:				
Regular funds.....	43,393	40,900	40,900	- - -
Emergency relief funds.....	9,404	1,852	- - -	- 1,852
Total.....	52,797	42,752	40,900	- 1,852
3. Forest regeneration:				
Regular funds.....	77,872	85,575	85,575	- - -
Emergency relief funds.....	52,355	16,514	- - -	- 16,514
Total.....	130,227	102,089	85,575	- 16,514
4. Fire protection:				
Regular funds.....	114,095	117,950	117,950	- - -
Emergency relief funds.....	41,460	8,167	- - -	- 8,167
Total.....	155,555	126,117	117,950	- 8,167
5. Naval stores:				
Regular funds.....	20,335	17,314	17,314	- - -
Emergency relief funds.....	10,724	2,113	- - -	- 2,113
Total.....	31,059	19,427	17,314	- 2,113
6. Forest genetics:				
Regular funds.....	74,640	80,305	80,305	- - -
Emergency relief funds.....	6,473	1,275	- - -	- 1,275
Total.....	81,113	81,580	80,305	- 1,275
<u>Total obligations:</u>				
Regular funds.....	618,625	638,403	638,403	- - -
Emergency relief funds.....	413,669	89,602	- - -	- 89,602
Total.....	1,032,294	728,005	638,403	- 89,602

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
Unobligated balance (regular funds).....	\$ 2,369	- - -	- - -	- - -
<u>Total (all funds):</u>				
Regular funds.....	620,994	\$638,403	\$638,403	- - -
Emergency relief funds....	413,669	89,602	- - -	-\$89,602
Total.....	1,034,663	728,005	638,403	- 89,602

WORK UNDER THIS APPROPRIATION

General.--The research carried under this appropriation is concerned with the problems of establishing and growing forest crops on forest land, regardless of ownership, and of protecting them from fire. Investigations are under way in all the important regions in the United States except in the Great Plains, Alaska, and the Island Possessions. In each region where research is carried on emphasis is placed upon the most pressing and urgent problems. These investigations are basic to the successful practice of forestry.

Forest-management investigations supply the facts on which sound forestry practices are based. Specifically, they aim to provide the information needed by Federal, State, and private agencies and individuals to enable them to reforest, protect from fire, and manage forest land to the best advantage, to insure an adequate future supply of lumber and other forest products, to increase the quality and quantity of forest products, and to maintain forest cover where needed for recreation and the protection of watersheds and wildlife. They have developed methods, which are being applied on a national scale by the CCC, in stand improvement, reforestation, hazard reduction, and fire control. They have disclosed many of the fundamental principles bearing on the location of lookouts, firebreaks, and roads and trails being constructed on the national forests and the national parks. They have supplied data on reforestation and naval-stores practices to the Agricultural Adjustment Administration and have furnished information on growth, forest management, and forest protection to the States and to various other public and private agencies. These investigations furnish information essential to the management and protection of the national forests. The work is specifically authorized by Section 2 of the Act of May 22, 1928 (McNary-McSweeney Forest Research Act), which authorizes and directs the Secretary of Agriculture to conduct fire, silvicultural, and other forest investigations and experiments and to establish and maintain certain designated forest experiment stations for that purpose. The work is being carried out under the following projects:

1. Silvicultural investigations.--This project furnishes basic information necessary to manage forest lands and to grow forest trees as a crop. Because of the great diversity of growing conditions, over 50 major forest types and 180 commercially important forest-tree species have to be dealt with. Diversity of ownership and interests further complicate the problems of forest-land management. Prior to the establishment of the Forest Service little was known about the habits, requirements, and possibilities of American forest-tree species and types, and the information available today is far from complete. Specifically, silvicultural investigations aim to determine the distribution, habits, requirements, and ecological relations of the more important forest-tree species and types; and how commercially important forest types are to be managed to insure perpetuation of the more desirable features, maximum forest production, sustained yield, and high-quality forest products. Such information is essential to the proper management of the national forests and is urgently needed by State and private forest landowners if forest cover is to be maintained, watersheds protected, and the country's future needs for forest products supplied. This work is now carried on by 12 regional forest experiment stations.

2. Mensuration investigations.--The object of this project is to determine the rate of growth of trees and stands. It includes the preparation for each of the commercially important forest-tree species of "volume tables" showing the average contents of trees of different dimensions and conditions in terms of cubic feet, board feet, cords, and other units; "growth tables" showing the average relation of height, diameter, and volume to age; and, for each of the commercially important forest types, "yield tables" showing the characteristics of the stand at different ages and the yield to be expected under various conditions and methods of handling. There are about 180 forest-tree species and 50 or more forest types of commercial importance in the United States about which such information is needed. In addition, it is necessary to standardize the form and substance of such tables and the technique of their preparation and application, to explore the fundamental laws of form and growth, and to adapt and apply statistical methods to the solution of other American forestry problems. Work is under way on this project at Washington, D.C., and at 10 regional forest experiment stations.

3. Forest regeneration investigations.--This work involves the further development of methods of reforesting denuded or poorly stocked forest land. It is estimated that there are 83,000,000 acres of such land in need of planting. Accordingly, it is necessary to determine for each of a large variety of conditions the species and methods of regeneration to be employed; the best method and season of direct seeding, where direct seeding is possible; the size and class of planting stock to be used, where planting is necessary; the details of nursery practice and the technique of field planting; and ways and means by which natural regeneration can be induced or stimulated. This involves examination of past plantings to determine the causes of success or failure, studies of seed production and dissemination, and studies of nursery methods and planting technique. Work of this sort is now in progress at 10 regional forest experiment stations.

4. Fire protection investigations.--Work in this field deals with the effects of forest fires and with ways and means for their prevention and control. Specifically, studies are being made of procedures by which forest fires can be prevented; of equipment and methods best suited to detect and control fires under different conditions; of the relation of weather, topography, and fuel conditions to the occurrence and behavior of forest fires; of how periods of high hazard can be forecast; of the extent and character of the damage resulting from forest fires, season of occurrence, concentration, cause of probability; and of the degree of hazard prevailing in each of the various protection units and forest types involved. Work of this sort is now under way at eight regional forest experiment stations.

5. Naval stores investigations.--The naval-stores industry has long been important in the South. Early methods of turpentine were crude and inefficient and resulted in the waste of much valuable timber. The object of these investigations is to further improve the technique of turpentine production and the equipment used; to determine the effect of tree size, weather conditions, and surface fires on yield; to study the effect of various methods of turpentine on tree growth and timber quality; and to work out the best means of combining turpentine and timber production. Investigations are now under way at the Southern Forest Experiment Station.

6. Forest genetics investigations.--The segregation or production of desirable strains by breeding, a procedure which has proved invaluable with crop plants, is practically unexplored with respect to forest trees. Work under this project is aimed at the production of trees of higher rates of growth, more resistant to diseases and insects, of better form, and capable of producing higher-quality forest products. This involves the study and segregation of geographical strains and races, studies of the technique of natural and artificial cross pollination and fertilization, experiments in hybridization, investigations of the genetical constitution and transmission of desirable characteristics, field trials of promising individuals and strains, and similar studies. The work is conducted at the California and the Northeastern Forest Experiment Stations.

(h) RANGE INVESTIGATIONS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938. . .	\$225,935	\$23,992	\$249,927
Budget Estimate, 1939. .	225,935	- - -	225,935
Net change.	<u>- - -</u>	<u>-23,992</u>	<u>-23,992</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. Grazing management investigations:				
Regular funds.....	\$139,222	\$170,717	\$170,717	- - -
Emergency relief funds....	51,097	16,986	- - -	-\$16,986
Total.....	190,319	187,703	170,717	- 16,986
2. Artificial reseeding:				
Regular funds.....	29,434	39,218	39,218	- - -
Emergency relief funds....	7,540	2,506	- - -	- 2,506
Total.....	36,974	41,724	39,218	- 2,506
3. Range forage:				
Regular funds.....	12,426	16,000	16,000	- - -
Emergency relief funds....	11,920	4,500	- - -	- 4,500
Total.....	24,346	20,500	16,000	- 4,500
<u>Total obligations:</u>				
Regular funds.....	181,082	225,935	225,935	- - -
Emergency relief funds....	70,557	23,992	- - -	- 23,992
Total.....	251,639	249,927	225,935	- 23,992
Unobligated balance (regular funds).....	853	- - -	- - -	- - -
<u>Total (all funds):</u>				
Regular funds.....	181,935	225,935	225,935	- - -
Emergency relief funds....	70,557	23,992	- - -	- 23,992
Total.....	252,492	249,927	225,935	- 23,992

WORK UNDER THIS APPROPRIATION

General.--The work under this appropriation consists of investigations to develop better methods of management of forest and other ranges. It is furnishing basic technical information necessary for the administration of the range resource in the national forests and on other ranges, public and private. It is also formulating the methods necessary for range improvement, revegetation for flood control, and other range-land phases of the work of the CCC and related projects. The studies of range management to offset destructive drought losses have aided immeasurably in relief and land-use adjustments. The 900 million acres of forest and untimbered range land represent nearly half the land area of the United States. Forage productivity of the great western range has been decreased over 50 percent through overgrazing and drought as shown by the Norris Report (Senate Doc. 199, 74th Congress). Proper range-management practices are necessary for the conservation of the range resources and to assure the stability and economic welfare of the livestock industry dependent upon these lands. These investigations alone can supply the required information.

Range research is being carried on under the authorization contained in Section 7 of the Act of May 22, 1928 (McNary-McSweeney Forest Research Act), which provides for experiments and investigations under the direction of the Secretary of Agriculture to develop improved methods of management, consistent with the growing of timber and the protection of watersheds, of forest ranges and of other ranges adjacent to the national forests, at forest or range experiment stations or elsewhere. The projects include:

1. Grazing management investigations.--This work consists of investigations to develop methods for managing range lands that will assure the stability and perpetuation of range resources, including forage, watershed, timber reproduction, and other range-land values. It involves determination of the grazing capacity of various range types and of ways and means of restoring and maintaining the better forage plants, improving methods of handling livestock on ranges, controlling losses from poisonous plants, reducing the fire hazard by grazing, and harmonizing grazing with other range-land values.

The studies involve high summer ranges, mainly on national forests, foothill spring-fall ranges, desert winter ranges, and semidesert year-long ranges. These studies have aided greatly in the better coordination for profitable use of these important parts of the year-long livestock operation, and they promise additional results urgently needed by the livestock industry and by the Federal and State governments in their plans for permanent land use and development. This work is now conducted at the six regional forest and range experiment stations in the West.

2. Artificial reseeding investigations.--This work includes investigations to develop methods of restoring artificially the plant cover on seriously depleted ranges and abandoned dry farms. Studies are under way to determine what native species justify selection for improvement, the possibilities for adapting native and introduced species for seeding or

transplanting, and how they can be most economically reproduced and established on range lands. These studies promise results of vital importance to the range livestock industry and to Federal and State agencies in planning sound land use on a permanent basis. The work is being conducted mainly by the Intermountain and the Northern Rocky Mountain Forest and Range Experiment Stations.

3. Range forage investigations.--Work under this project includes the collection and analysis of information on the identity, distribution, and the forage and watershed protective and other values of over 12,000 plant species which inhabit forest and other ranges--information absolutely essential to good range management. It includes the building up of the most complete annotated working herbarium of range plants in the country, a basic feature in meeting the demands for information incident to these studies. This is a continuing study. Range plants and data are collected by all the administrative and research personnel of the Forest Service concerned with range management. The major compilation and analyses are made in Washington.

(i) FOREST PRODUCTS INVESTIGATIONS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938.	\$628,361	\$37,403	\$665,764
Budget Estimate, 1939.	<u>628,361</u>	<u>- - -</u>	<u>628,361</u>
Net change.	<u>- - -</u>	<u>-37,403</u>	<u>-37,403</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. Timber harvesting:				
Regular funds.....	\$83,617	\$88,000	\$88,000	- - -
Emergency relief funds.....	28,854	5,684	- - -	-\$5,684
Total.....	112,471	93,684	88,000	- 5,684
2. Forest products statistics:				
Regular funds.....	10,623	10,000	10,000	- - -
Emergency relief funds.....	532	105	- - -	- 105
Total.....	11,155	10,105	10,000	- 105
3. Pulp and paper:				
Regular funds.....	101,988	112,000	112,000	- - -
Emergency relief funds.....	43,514	8,572	- - -	- 8,572
Total.....	145,502	120,572	112,000	- 8,572

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
4. Strength of wood:				
Regular funds.....	\$134,158	\$133,361	\$133,361	- - -
Emergency relief funds.....	26,288	5,178	- - -	-\$5,178
Total.....	160,446	138,539	133,361	- 5,178
5. Seasoning and physical properties:				
Regular funds.....	70,912	80,000	80,000	- - -
Emergency relief funds.....	21,241	4,184	- - -	- 4,184
Total.....	92,153	84,184	80,000	- 4,184
6. Chemical composition:				
Regular funds.....	63,809	63,000	63,000	- - -
Emergency relief funds.....	8,710	1,716	- - -	- 1,716
Total.....	72,519	64,716	63,000	- 1,716
7. Wood preservation:				
Regular funds.....	92,564	94,000	94,000	- - -
Emergency relief funds.....	37,777	7,441	- - -	- 7,441
Total.....	130,341	101,441	94,000	- 7,441
8. Wood structure:				
Regular funds.....	48,588	48,000	48,000	- - -
Emergency relief funds.....	22,960	4,523	- - -	- 4,523
Total.....	71,548	52,523	48,000	- 4,523
Total obligations:				
Regular funds.....	606,259	628,361	628,361	- - -
Emergency relief funds.....	189,876	37,403	- - -	-37,403
Total.....	796,135	665,764	628,361	-37,403
Unobligated balance (regular funds).....	2,102	- - -	- - -	- - -
Total (all funds):				
Regular funds.....	608,361	628,361	628,361	- - -
Emergency relief funds.....	189,876	37,403	- - -	-37,403
Total.....	798,237	665,764	628,361	-37,403

WORK UNDER THIS APPROPRIATION

General.--Forested land, aside from providing timber, affords benefits of far-reaching importance through its favorable influence on stream flow, in preventing excessive erosion, in providing shelter and protection for homes, crops, and livestock against wind and drought, in providing forage, in supplying recreational needs, and in furnishing the environmental conditions upon which the wildlife of the country depend. These benefits, though not so readily appraised, may well represent values to the public far greater in the aggregate than those realized from timber alone. The growing of timber for the many products demanded by modern civilization, however, represents the more tangible economic value or use of forest land. But the interests of economic forestry do not come to an end with the growing of an increased timber supply; the utility value of wood must be maintained and increased. Hence a broad and intelligent utilization of our forest resources becomes an indispensable feature of an adequate national forestry program. The foundation of efficient utilization is research in forest products.

The better adaptation of wood to modern consumption requirements is a matter of direct concern to consumers, whose proper housing and standards of living are bound up with the satisfactory use of wood products; to workmen, who need the hundreds of millions of dollars in wages furnished by employment in the woods, the sawmills, the pulp mills, and broadly diversified fields of wood construction and manufacture; to farmers and other timberland owners, large and small, seeking market outlets for materials from their vast aggregate acreage of woodlands; to local communities, counties, States, and the Nation, which have a vital interest in stable revenues from forests, forest lands, and successful forest industries. In our national forests alone, the investment in land and timber and the responsibility for a wise utilization of the products require a broad program of research looking to the broadening and stabilization of markets for forest products.

The bulk of the work in forest-products research is centered at the Forest Products Laboratory at Madison, Wisconsin, with some associated work at forest experiment stations and at Washington, D.C. Since its establishment in 1910 the Laboratory has become the outstanding institution of its kind in the world. Conservative estimates place the annual savings to users and producers, alone through application of Laboratory findings, at a figure at least 100 times the cost of operation. Only a small part of the needed work in forest products has been done. There can be no question of the vital part that forest-products investigations play in the whole forestry program.

The work is done under the authorizations for forest products investigations of domestic woods and of tropical woods specified under Section 8 of the Act of May 22, 1928 (McNary-McSweeney Forest Research Act), which authorizes and directs the Secretary of Agriculture to conduct experiments, investigations, and tests with respect to the physical and chemical properties and the utilization and preservation of wood and other forest products, including tests of wood and other fibrous material for pulp and paper making, and such other experiments, investigations, and tests as may be desirable, at the Forest Products Laboratory or elsewhere. The work is conducted under the following projects:

1. Timber harvesting and conversion investigations.--This work includes costs and returns in logging and milling trees and logs of different sizes; design of logging machinery; selection and grading of lumber; and wood-use development.

Millions of acres of barren cut-over land in the South, the East, the Lake States, and of late in the West are the result of the general belief among timber operators that maximum returns necessitated felling all trees of the desirable species that would cut out any lumber. The owner of forest land is now learning that practically his only chance of low-cost and high-yield continuous production is to evaluate returns on the basis of analytical data, such as the Forest Service has recently been making available, which dictate removal of the larger trees and leaving the smaller trees for growing stock.

Under prevailing practice the timber left, or that has restocked the cut-over areas, has consisted largely of species less valuable than those removed. To find new uses for these species, based on their best utility values, is a major forestry problem and a feature of this project. Its solution will enable their profitable removal and at the same time improve the forest. Coupled with this is the problem of converting the present 50 percent waste in the woods and at the mill into marketable commodities.

Lumber is separated at the mill into classes or grades on a basis of the number, condition, and size of visible defects. Rules for grading have become more and more complicated, with resultant difficulties and misunderstanding between manufacturers and users. The Forest Products Laboratory has played a prominent part in various movements to improve and simplify grading rules. Federal specifications prepared by the Forest Service govern the purchase of lumber by the Government.

2. Forest products statistics.--Information as to the production, consumption, and distribution of lumber and other forest products is essential to the orderly manufacture and marketing of forest products; the maintenance and proper distribution of adequate and suitable supplies of raw material for wood users; and as a basis for planned forest production. These data form the necessary economic background needed by Federal, State, and private agencies dealing with forest, industrial, and social programs and policies.

The work is handled by statistically trained foresters in the Washington office and at several of the western forest experiment stations. Under a cooperative agreement with the Bureau of the Census, data are obtained from the forest industries concerned by a canvass and are then compiled, analyzed, and published.

3. Pulp and paper investigations.--This work includes studies of the suitability of various woods for pulps and papers and the development of new and improved manufacturing processes.

The value of pulp and paper products made annually in the United States is, roughly, \$1,000,000,000. The domestic consumption of wood for

paper is approximately 7-1/2 million cords (about 10 percent of which is imported), valued at \$58,000,000. In addition, wood pulp and paper are imported to the equivalent of about 6 million cords of wood.

The use of wood for pulp far exceeds that of any other raw material and, although the quantity thus used constitutes only about 5 percent of the total timber cut of the United States, it is of large importance by virtue of being a profitable outlet for a class of timber and for wood wastes having practically no other value except as fuel. Furthermore, the removal of much of this material (as thinnings, etc.) is a feature of good forestry.

Looking to the future, making the United States self-sufficient as to pulpwood requirements could mean doubling the national income from pulpwood, with added large values from manufacture, and jobs for 250,000 more persons than were engaged in the pulp and paper industry in 1929.

Definite progress has been made by the constant search for new or modified processes that will enable using woods other than spruce, which now supplies 70 percent of our pulp and paper requirements. As a result of work by the Forest Service and other organizations, much prominence has recently been given in the press to the Southern pines as a possible source of newsprint. This work on southern pine will be continued, as will the work to find a process adapted to pulping Douglas fir, especially in the form of woods and mill waste, of which enormous quantities are available; and also the work to check stream pollution by developing methods of recovery and re-use of waste cooking liquors.

4. Strength of wood investigations.---This work includes studies of the strength and related properties of wood and improvement in design of structures, containers, and other wood products.

Besides its importance to the average citizen and home builder, this project has a vital relation to the utilization of timber and the liquidation of forestry investments. Building construction normally consumes more than 60 percent of our annual lumber production, a large proportion going into small houses. In recent years, however, the use of wood in buildings in comparison with other materials has shown a great decline, chiefly because lumber in construction does not reflect the modern trends toward lower costs in the handling and assembly of other materials.

Improvements in the engineering of wood construction such as are now under study at the Forest Products Laboratory to make possible the building of simple and inexpensive but thoroughly satisfactory wooden houses would mean more desirable homes for families with small resources, as well as new life in the construction industry. New developments in heavy timber construction which are now under investigation also promise a great advance in engineering economy. About one-sixth of the total lumber production is used for boxes and crates. Improvements in these and other containers benefit the consumer through their effect on the cost of shipping the products he uses.

This project involves strength tests of the clear wood of all commercially important species, both from virgin and second-growth stands in various forest regions; investigations of factors affecting properties, such as defects, moisture content, and weight; appraisal of the effect of preservative, seasoning, and other processes; and determination of the efficiency of nails, bolts, screws, glues, and other mediums for joining wood members or parts.

5. Seasoning and physical properties investigations.--This work includes studies of kiln drying, air seasoning, and storage of lumber; of the moisture content of wood in use; of seed-extraction equipment; and of the insulation of buildings.

Improper seasoning methods and poor storage, handling, and construction practices cause losses of more than \$100,000,000 annually. They include the entire loss of certain species which can not now be seasoned; the loss of footage and value through degrade; and the damage from swelling, shrinking, and warping of fabricated products and structures. The reduction of these losses, in whole or large part, is the goal of the Laboratory's work.

Kiln-drying principles and methods developed at the Laboratory have revolutionized the kiln-drying industry. More than half the kilns built in the United States in the past five years are of the internal fan type developed at the Laboratory.

6. Chemical composition and wood-utilization investigations.--This work includes studies of the chemical composition and utilization of wood; of physical-chemical structure and properties; and the development of improved and new chemical processes and products.

Wood constitutes the largest and most convenient source of cellulose, one of our most important raw materials. Chemical means must be used in isolating the cellulose because the lignin with which it is surrounded resists all other methods. Science confidently looks forward to the conversion of cellulose into other important commodities in addition to paper, artificial silk, fabric, cellophane, lacquers, and plastics for which it is now used. Lignin comprises one-quarter of the wood but, because of its chemical complexity, no method of utilizing it has been devised. It is wholly wasted in the pulping processes. Since both cellulose and lignin must be isolated by chemical means and converted into other commodities by chemical processes, the economic importance of a thorough knowledge of their chemical nature can hardly be overestimated.

The chemical composition of wood substance, the arrangement of constituent parts in the wood cell, the size and spacing of the cells, and the variation of all such characteristics according to species and growth conditions are intrinsic factors which determine the useful properties of wood in mass. The aim of this project is to attain a scientific understanding of these factors, which is essential to the best results in growing the wood, in its selection, its seasoning and handling, its impregnation with preservatives, its use in construction, and its con-

version into pulp and other products. The work involves the conversion of wood waste into wood-distillation products, grain alcohol, plastics, and other useful materials.

7. Wood preservation investigations.--This work includes studies of wood treatments to increase resistance to decay, insects, and fire; and of coatings, paints, glues, and laminated construction.

Rail transportation costs depend to a considerable degree upon economy and efficiency in the use of wood for railway ties, bridges, poles, piling, and other construction. The railroads use nearly one-fifth of the total annual lumber production and spend over \$100,000,000 per year for wood and much larger sums for its treatment and installation. Preservative treatment has greater influence than any other factor in reducing annual costs for wood used by railroads. Likewise public-utility costs are influenced by the efficiency obtained in the use of poles and other wood in the distribution systems.

Fire losses in wooden structures constitute an enormous loss that can be reduced by the discovery of cheap and effective fireproofing methods. The cost to home owners of maintaining the paint on their property is estimated at \$375,000,000 annually. The strength and durability of glue joints have a profound influence upon the service given by glued products, for which the public pays about \$1,000,000,000 per year. Losses from defective gluing are heavy. The performance of wood in floors, furniture, house trim, aircraft, and numerous other uses is impaired by shrinking and swelling with moisture changes, the prevention of which is of the highest importance in maintaining markets for wood. The work under this project is largely of direct value to the consumer.

The work involves experiments to improve wood preserving processes; service records of treated material subjected to conditions of actual usage; records of the lasting qualities of various paints applied to wood panels of different species and exposed in various regions; tests to determine the fire resistance of both small pieces subjected to fire-resistant treatments and of full-sized structural units; and the improvement of glues and gluing methods.

8. Wood structure and growth investigations.--This work includes the microscopic identification of wood; and studies of the relation of growth conditions to wood quality, the relation of structure to properties, and the formation of resin.

Knowledge of wood structure is essential in identifying the thousands of wood and pulp samples submitted by Government officials and the public. Such identifications aid in selecting the right kind of wood for a given purpose in adjusting disputes between buyers and sellers and many times have proved very helpful in criminal cases involving wood.

Knowledge of the relation of growth conditions and structure to properties makes it possible to overcome trade prejudices and to broaden the uses of wood, to safeguard the public against defective material, and

thus to increase the value and efficiency of wood in service. The information obtained is of value in selecting species for reforestation, in the profitable use of marginal agricultural lands and overflow lands for producing future forest crops, and in controlling the growth factors which influence the properties of the wood.

(j) FOREST SURVEY

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938. . . .	\$220,000	\$16,669	\$236,669
Budget Estimate, 1939. . .	220,000	- - -	220,000
Net change.	<u>- - -</u>	<u>-16,669</u>	<u>-16,669</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
Forest survey:				
Regular funds.....	\$199,471	\$220,000	\$220,000	- - -
Emergency relief funds...	84,623	16,669	- - -	-\$16,669
Total.....	284,094	236,669	220,000	- 16,669
Unobligated balance (regular funds).....	529	- - -	- - -	- - -
<u>Total (all funds):</u>				
Regular funds.....	200,000	220,000	220,000	- - -
Emergency relief funds...	84,623	16,669	- - -	- 16,669
Total.....	284,623	236,669	220,000	- 16,669

WORK UNDER THIS APPROPRIATION

The Forest Survey is specifically authorized by Section 9 of the Act of May 22, 1928 (McNary-McSweeney Forest Research Act), which authorizes and directs the Secretary of Agriculture to cooperate with appropriate officials of each State, either through them or directly with private and other agencies, in making a comprehensive survey of the present and prospective requirements for timber and other forest products in the United States and of timber supplies, including a determination of the present and potential productivity of forest land therein and of such other facts as may be necessary in the determination of ways and means to balance the timber budget of the United States.

The work includes an authoritative nation-wide inventory of the extent, location, and condition of forest lands; the quantity, kinds, quality, and availability of timber now standing on these lands; the rate of depletion through cutting, fire, insects, disease, and other causes;

the current and probable future rate of timber growth and the productive capacity of our forest area; and the present and probable future requirements for forest products in the different parts of the country by all classes of consumers, including many major industries. It also includes analyses of the relation of these findings to one another and to other economic factors as a basis in formulating policies, principles, and plans of forest-land utilization. It involves both field surveys and compilation of existing data from a great variety of sources.

The Survey is currently obtaining forest resource information long desired and now vitally important as a guide in directing the course of national measures involving conservation and land use, such as balance of growth and depletion to build up growing stock and bring into effect sustained yield; correlation and distribution of industrial requirements with forest productive capacity of the soil; public acquisition of land for forest purposes; reversion of submarginal agricultural land to forests; Civilian Conservation Corps programs; Tennessee Valley development, and creation of permanent forest communities. The accumulation and interpretation of data are far behind the current demand for information.

The Survey is conducted under the work project "Forest Survey" and mainly in the regions served by the following forest experiment stations:

Appalachian.--It is especially important to push work here because of closeness to consuming centers, imminent pulp expansion and corresponding timber requirement, the farm woodlot situation, and dearth of economic information on the forest resource situation in the region. It is an important timber-producing area, is going through industrial and rural change and expansion, and is characterized by a high percentage of community dependence on timber and important watershed value; and all these augur the necessity for a realistic economic and forest program.

California.--Limited Federal funds have restricted the work to the preparation of a forest-cover type map to fill general needs and be of special use in the remaining steps of the work. The other phases of the survey will follow as rapidly as funds become available.

Lake States.--Primary field work is nearly complete for the 60 million acres of forest land in this region. In close cooperation with the States of Michigan, Wisconsin, and Minnesota, work toward compilation, interpretation, and release of the information collected is going forward.

Northern Rocky Mountain.--Because of the regional and national importance of the 26 million acres of forests in this territory, especially the highly prized white pine, the Federal Government is spending large sums of money for fire and tree-disease protection. In the public interest, also, there is an incessant demand for forest-resource data upon which to base land-use plans for the four Northwestern States. The annual cut not only exceeds growth but is so unevenly distributed as to endanger the permanence and welfare of dependent communities. Needed corrective measures must be based on an accurate analysis of the forest situation.

Pacific Northwest.--In addition to the type maps and preliminary reports for the Douglas-fir belt of Oregon and Washington, already released, measurable headway has been made toward the final report for this area which will give complete factual forest-resource data and policies for economic land use. This area supports the largest remaining supply of virgin timber, yet is confronted with an unsatisfactory, unplanned forest situation. Survey reports supply data basic to sustained yield plans, involving both public and private timberland, and industrial requirements and policies for forest units; they also furnish information on intent of ownership and point out critical areas. During the year major final reports for this area will be pushed toward completion and work will be initiated to keep the forest-resource data up to date. A field inventory of the pine types of eastern Oregon and Washington was completed late in the year. Work will now be directed to the compilation and analysis of the data obtained.

South.--Encompassing over 150 million acres which takes in the naval-stores district, the bulk of the Southern-pine lumber-producing stands, and the chief commercial hardwood area of the Nation, including the heavy dependent population, this region ranks near the top as a fertile place to work out sound, long-time forest land-use management. Except for Texas and Oklahoma where a small amount of work remains, the field inventory is practically finished. Present work includes compilation, analysis, interpretation, and report preparation for the tremendous amount of data collected. Considering demands for special reports on certain phases of the work, satisfactory progress has been made. Plans are being initiated to keep the forest-resource information up to date.

(k) FOREST ECONOMICS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938. . .	.\$121,295	\$7,208	\$128,503
Budget Estimate, 1939. . .	<u>121,295</u>	- - -	<u>121,295</u>
Net change	<u>- - -</u>	<u>-7,208</u>	<u>-7,208</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. New public domain:				
Regular funds.....	\$26,644	\$24,350	\$24,350	- - -
Emergency relief funds....	198	39	- - -	- \$39
Total.....	26,842	24,389	24,350	- 39
2. Private forestry:				
Regular funds.....	51,776	67,945	67,945	- - -
Emergency relief funds....	36,395	7,169	- - -	-7,169
Total.....	88,171	75,114	67,945	-7,169

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
3. Stumpage, log, and lumber prices:				
Regular funds.....	\$12,247	\$14,000	\$14,000	- - -
Emergency relief funds....	- - -	- - -	- - -	- - -
Total.....	12,247	14,000	14,000	- - -
4. Range economics:				
Regular funds.....	- - -	15,000	15,000	- - -
Emergency relief funds....	- - -	- - -	- - -	- - -
Total.....	- - -	15,000	15,000	- - -
<u>Total obligations:</u>				
Regular funds.....	90,667	121,295	121,295	- - -
Emergency relief funds....	36,593	7,208	- - -	-\$7,208
Total.....	127,260	128,503	121,295	- 7,208
Unobligated balance (regular funds).....	628	- - -	- - -	- - -
<u>Total (all funds):</u>				
Regular funds.....	91,295	121,295	121,295	- - -
Emergency relief funds....	36,593	7,208	- - -	- 7,208
Total.....	127,888	128,503	121,295	- 7,208

WORK UNDER THIS APPROPRIATION

General.--This is a series of studies which, in correlation with other forest research, strike directly at efficient and economical ways of attaining the important forest land-use objectives upon which sound forest industrial plans must be based.

This work is specifically authorized by Section 10 of the Act of May 22, 1928 (McNary-McSweeney Forest Research Act), which provides for investigations of costs and returns and the possibility of profitable reforestation under different conditions in different forest regions; of the proper function of timber growing in diversified agriculture and in insuring the profitable use of marginal land, in mining, transportation, and in other industries; of the most effective distribution of forest products in the interest of both consumer and timber grower; and for other necessary economic investigations of forest lands and forest products. The work is conducted under the following projects;

1. New public domain investigations:--A "new public domain" is being created by the abandonment and reversion to public ownership through tax delinquency of cut-over forest land. This study is investigating the

extent and trends of reversion in different regions, the feasibility of using the land for forest purposes, the desirable balance of ownership between Federal, State, and other public agencies, and the methods and aims of public administration and use. These investigations are conducted in the following regions:

(a) California.--This State has exceptionally acute and complicated problems of land use, especially in its 40 million acres of foothill area which constitutes a wide margin of conflicting use between the forested mountains and the agricultural valleys. Excessive overgrazing has long been the rule and has seriously depleted the forage-producing capacity of the grazing lands. Former timber wealth is gone; the livestock industry is in serious straits; agriculture is precarious; population and wealth are declining; communities are in distress; lands are tax delinquent, and county governments are pinched. Land abuses in the marginal foothill zone further combine with destruction of the forests at higher elevations to accelerate erosion and produce serious disturbances in the annual water crop, upon the integrity of which all other crops in most of California depend. Through readjustments of land use many of these conditions can be ameliorated, and the high costs of local government services, such as roads and education, in sparsely populated areas, can be materially reduced. Fundamental information of first importance in connection with corrective programs of land-use planning will be supplied as a result of land-utilization studies by the California Experiment Station.

(b) Lake States.--The abandonment of cut-over land has reached a more acute stage in the Lake States than in any other region. At least 20,000,000 acres of land have reverted to public ownership or are suffering under long term delinquency. This study, prosecuted in cooperation with other Federal, State, and local agencies, is already supplying information and advice of vital importance to the formulation and application of constructive land-utilization plans, including the correlation of agricultural and forest use, the greatly expanded program of Federal acquisition, and the development of State and county forest systems, in the Lake States.

(c) Pacific Northwest.--The destructive cutting of privately owned forest land in Oregon and Washington; the serious and increasing extent of tax delinquency, forfeiture, and abandonment of these lands; and the attempts to settle them for agricultural purposes have produced deplorable physical, economic, and social results. The instability of forest-land ownership is increasing; precipitate losses are taking place in the tax base and in tax receipts essential for the maintenance of public services; and industries and the opportunity for labor are being lost. Added to these factors is the continued and uncontrolled practice of placing settlers on forest lands unsuited for agricultural purposes and remote from established roads, schools, and other advantages of community life, where fire is a hazard to life and property and where their presence adds to the burden of property owners, taxing jurisdictions, and social agencies. But no legal control over these practices and no reasonably lasting solution of these problems are possible unless and until local awareness takes place, a delineation between forest and other lands is made, and ways of stabilizing ownership, employment, and social betterment are developed.

(d) South.--The average of forest land forfeited to public ownership through nonpayment of taxes has increased to such an extent during recent years as to constitute a major problem in the fiscal affairs of the several States and their minor divisions and an even greater problem in forest land-use planning.

An analysis of the causes and determination of the extent of this situation is one of the basic requirements in the development of a sound forest land-use policy. Data already available from this study are in demand by the A.A.A., State Planning Boards, State Foresters, and other agencies and individuals. These agencies, together with State and local governments, are cooperating.

2. Private forestry investigations.--Current work includes a search for ways and means of replacing the customary destructive methods of exploitation with the practice of forestry, including sustained yield management on privately owned lands. This requires appraisal of the economic factors in various forest regions that are obstructing forestry practice and the formulation of new operating methods and other means, including needed public assistance, that will aid in overcoming these obstacles. The work also includes studies of the financial aspects of forestry, especially of the costs and returns from timber growing, to determine for various forest regions where and under what economic conditions forestry may be successfully practiced; and a study of the potential contributions of forestry to community stability and prosperity. These investigations are being conducted mainly in the following regions:

(a) Pacific Northwest.--The Douglas-fir belt includes one-third of our remaining saw timber. Three-fifths is in private ownership and characterized by destructive utilization practices; cut-over land is often rendered completely unproductive by successive burnings; and sawmill capacity is far in excess of sustained yield capacity or market requirements. Altogether, this represents the most serious and baffling "sore spot" in the Nation's forest-economic situation. This study is furnishing vital information as to practical and profitable means (including revolutionary changes in the mechanics of logging and in methods of cutting) of converting the industry to sustained yield management.

In the Ponderosa pine belt present operating practices are reducing potential rates of annual growth from as high as 200 to as low as 10 to 25 board feet per acre. This study will provide basic information needed in fixing diameter cutting limits, spacing of railroad spurs, skidding distances, and desirable types of machinery; in brief, information necessary for the elimination of wasteful and uneconomic practices, and for the stabilization of lumbering operations, communities, and labor conditions.

(b) South.--Most of the 200 million acres of forest land is privately owned. Because of its enormous potential productive capacity and favorable location, the region is the logical source of timber for much of the eastern United States and for export trade. The forest resource is the basis of the world's largest naval-stores industry. But forest productivity has seriously deteriorated and industry has correspondingly suffered as the result of uneconomic practices. If the forest-products industries are to be rehabilitated, the practice of forestry must be installed on private land and forest productivity must be restored.

An analysis of the cost of growing timber and the returns to be derived therefrom--in other words, the conditions under which private forestry will be practicable--is especially needed. This study is designed to supply that information. The development of private forestry is of the utmost importance, not only from the standpoint of the region itself because of the extent to which local economy must be based upon the forest resource, but to the whole eastern United States.

(c) Northeast.--The purpose of the work here is to obtain the technical basis for and to help develop to the point of self-support cooperative timber production, manufacturing, and marketing enterprises, particularly for farmers and other small owners. Unrestricted cutting of timber on farm woodlands, largely prompted by heavy demand from adjacent industrial population, has depleted the available timber to a point where many industries have been forced to move to other regions. Returns to woodland owners from the sale of timber are relatively low and realized only once in several decades. Manufacturing and marketing of forest products is generally on a haphazard and uncertain basis. Specifically, the procedure is to study the possibilities of cooperative management of small timber holdings, particularly farm woodlands, in typical natural units, with the belief that proper forest-management methods will permit a regular and dependable source of income to farmers and others. Studies in methods of cutting, transportation, manufacturing, and marketings are also under way.

(d) Central.--This study, initiated in 1937, has the same general objectives and is being conducted in the same general manner as the Northeast investigations described in the preceding paragraph. A steady demand for timber in the agricultural sections of the Central States provides very favorable opportunities for profitable forestry.

(e) Lake States.--The smaller forest-land holdings of the Lake States are potentially a very important feature of the economy of that region. With the depletion of virgin timber supplies, wood-using industries are turning more and more for raw materials to the remaining small tracts which have escaped large-scale exploitation, but heavy overcutting is resulting in a steady process of deterioration which is constantly reducing yields and, if continued, will also reduce income. The purpose of this study, commencing this fiscal year (1938), is to develop simple methods of economic organization that will give the smaller owners the benefit of collective action in forest management and in such utilization and disposal of forest products as will improve the quality and quantity of production from their woodlands, insure a steady field for labor and income for the landowner, and increase the effectiveness of these woodlands as soil-protection cover.

3. Stumpage, log, and lumber price investigations.--Stumpage and log prices are important elements in the production cost of lumber and other wood products. They are not compiled on a nationwide basis by any other agency. They are necessary in other important economic studies and influence the formulation and development of national, State, and private forest programs and are of value to the industry.

Current work includes the compiling and analyzing of price data for previous years from all available sources; the development of price trends and indexes; the comparison with price trends and indexes of important agricultural crops; the compilation of current price data; and the publication of an annual statistical bulletin. Basic data are collected annually through a cooperative agreement with the Bureau of the Census. Work to date has been confined mainly to stumpage and log prices. Work on lumber prices is as yet fragmentary because of limited facilities and funds. This is an important and continuing project. The work is done mostly in Washington.

4. Range economics investigations.--Work under this project is being carried on at the Intermountain Station. The importance of the range resources of this region and the necessity for their rehabilitation and wise use are being recognized more and more. The purpose of this study, commencing in the fiscal year 1938, will be to determine, for various conditions and combinations of livestock raising and agriculture, what size range unit is best adapted for family economy and how Federal range lands can best be integrated with such units. It is of vital importance in this region that the privilege of range use, particularly of the national-forest ranges, be neither unduly concentrated nor unduly dispersed. It must be distributed in a way that will promote prosperous family units and well-balanced permanent communities. The study will necessarily review the factors underlying economic welfare from the use of range lands in each type of community. It will involve, among other things, an analysis of the economic and social organization and activities of typical communities that are largely dependent on range resources. The results of the study should afford a basis for equitable redistribution of the use of the range, if such redistribution is found to be needed. This investigation will supplement, on the economic side, the program of range research provided for under Section 7 of the McNary-McSweeney Forest Research Act.

(1) FOREST INFLUENCES INVESTIGATIONS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938.	\$139,152	\$46,319	\$185,471
Budget Estimate, 1939 . . .	<u>139,152</u>	<u>- - -</u>	<u>139,152</u>
Net change	<u>- - -</u>	<u>-46,319</u>	<u>-46,319</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. Forest cover:				
Regular funds.....	\$32,752	\$72,920	\$72,920	- - -
Emergency relief funds	176,903	34,847	- - -	-\$34,847
Total.....	209,655	107,767	72,920	- 34,847

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
2. Brush and herbaceous cover:				
Regular funds.....	\$65,912	\$66,232	\$66,232	- - -
Emergency relief funds..	58,237	11,472	- - -	-\$11,472
Total.....	124,149	77,704	66,232	- 11,472
<u>Total obligations:</u>				
Regular funds.....	98,664	139,152	139,152	- - -
Emergency relief funds..	235,140	46,319	- - -	- 46,319
Total.....	333,804	185,471	139,152	- 46,319
Unobligated balance (regular funds).....	170,488	- - -	- - -	- - -
<u>Total (all funds):</u>				
Regular funds.....	269,152	139,152	139,152	- - -
Emergency relief funds..	235,140	46,319	- - -	- 46,319
Total.....	504,292	185,471	139,152	- 46,319

WORK UNDER THIS APPROPRIATION

General.--The research under this program is directed to a determination of the effect of forest, brush, or range cover, or of combinations of them, on soil and water. Its purpose is to determine whether such vegetative cover may serve as the major factor in providing satisfactory conditions of water flow and of controlling erosion on entire watersheds or important parts of watersheds; and, if so, whether it must be used in a virgin condition or may be modified by cutting or grazing. It seeks to ascertain how to conserve soil fertility and moisture for the growing of forest and range forage and how to deliver the maximum amounts of usable water for irrigation, municipal use, power, navigation, etc. Its objective is to make waste lands productive, to protect against destructive floods, and to safeguard public and private works -- investments which already aggregate hundreds of millions of dollars. In short, it is designed to furnish facts and remedial measures as a basis for action by Federal, State, and other agencies.

This is a continuance of the item carried in the Agricultural Appropriation Act under various headings since 1931, for investigations and experiments for determining and demonstrating the influence of natural vegetative cover characteristic of forest, range, or other wild land on water conservation, flood control, streamflow regulation, erosion, climate, and maintenance of soil productivity, and for developing preventive and control measures.

Practically every watershed in the United States contains some portion of the 615 million acres of forest land or of the 585 million acres of non-forest range land, or both. The disastrous Mississippi River flood and many other floods of recent years, the rapidly increasing demand for irrigation water throughout the West, and the shortage of municipal water for many cities and towns during drought years greatly accentuate the problem caused by increasing population and have focused attention on both forest and range as related to streamflow regulation and erosion control. These investigations are conducted under the following projects:

1. Investigations of forest cover in relation to watershed management.--This activity deals with the effects of forest cover on water supply. It includes studies of the effect of forests on flood and low-water flows, on erosion and other related phenomena, and, in fact, upon the whole water cycle. It supplies some of the framework for national-forest policies and is basic in formulating water-conservation and flood-control policies and programs for forest and other wild lands.

The enormous losses caused by floods, irregular streamflow, scarcity of water, shrinkage of underground reservoirs, and related phenomena have a far-reaching effect upon our national economy. The reduction of such losses on nonarable lands through proper utilization of natural cover and through special measures adaptable to such lands appears both possible and feasible. Where such losses due to forest fires, destructive logging, smelter fumes, or other causes destructive to the forest cover have reached an advanced stage, remedial measures suitable to local conditions are being worked out. These involve the solution of a number of complex problems, including the development of planting stock suited to impoverished soils and sites and in connection with various forestry engineering measures such as small check dams and water-retarding devices. The design of these measures and devices and their use and application are being worked out for a variety of conditions.

Finally, this project determines the relation between the cover as it is and as it might be under various conditions of use and conditions of water flow. These studies are basic to management policies on the national forests and other forest lands where water may be and often is of more value for domestic, irrigation, or municipal use than the forest itself. Work is now under way at the Appalachian, California, Southern, and Lake States forest experiment stations.

2. Investigations of brush and herbaceous cover in relation to watershed management.--This work includes studies to determine the relation of brush and herbaceous cover to erosion, streamflow, and groundwater levels; and the effects of grazing and how over-grazed and eroded areas can be reclaimed and their watershed values restored. Depletion of the natural vegetative cover through overgrazing on large parts of the 585 million acres of non-forest range lands has contributed greatly to the irregularity of streamflow, to the silting of streams, reservoirs, and irrigation works, and to the scarcity of water for domestic and irrigation uses. The results of these investigations have been of great value to Federal and State agencies in emergency programs of watershed management.

The urgent demand for additional information requires continuation of these studies, which are conducted by the Intermountain, Rocky Mountain, and Southwestern forest and range experiment stations. This work is very closely related to the preceding project.

(m) FOREST-FIRE COOPERATION

Appropriation Act, 1938. \$1,655,007
 Budget Estimate, 1939. 1,655,007

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Forest taxation and insurance investigations.....	\$44,642	\$45,000	\$45,000
2. Cooperation with States in forest-fire prevention and suppression.....	1,602,603	1,610,007	1,610,007
Unobligated balance.....	7,762	- - -	- - -
Total appropriation.....	1,655,007	1,655,007	1,655,007

WORK UNDER THIS APPROPRIATION

(1) Forest taxation and insurance investigations.--This work involves local application studies, in cooperation with State and other agencies, necessary to supplement, adapt, and effect the general conclusions and principles already determined to the widely varying conditions of individual States. Taxation under present methods is generally recognized as one of the greatest obstacles to private forestry practice and a major cause of forest destruction. Interest in forest taxation is widespread on the part of forest owners, State and local authorities, and the agencies concerned with the conservation and development of forest resources. Urgent demand is being made for aggressive Federal assistance in obtaining forest-taxation reform to accomplish the stated objectives of forest conservation and the rehabilitation of the forest-products industries under the recovery measures of the Administration. This demand has been stimulated by the critical tax situation in many forest regions and by the growing opinion that reform in taxation is vitally needed if the standards of private forestry practice are to be substantially improved.

This project also includes the investigations of principles of, and the feasibility of developing, a system of forest-fire insurance. Special emphasis is being given to the prosecution of this study because the information being obtained as to damage and risk elements is essential in the development of a sound system of forest credits, itself an important aid to the conversion of private forest enterprises from a destructive

liquidation to a sustained production basis. A comprehensive report analyzing the findings and possibilities and presenting constructive suggestions for setting up forest-fire insurance in the Pacific Coast States has been published, and a similar report for the Northeastern States is in process of preparation.

(2) Cooperation with States in forest-fire prevention and suppression.--Thirty-eight States and the Territory of Hawaii cooperate with the Federal Government in forest-fire protection under this program. Two additional States, Illinois and Missouri, have expressed their intention of qualifying for cooperation. The program of forest-fire protection is based on agreements which provide for plans of work by the individual States and the submission of budgets. Federal reimbursement is made to the cooperating States after the work is done and has been paid for by the States. The Forest Service provides technical assistance in all fields of endeavor pertaining to this cooperative forest-fire protection program, gives material aid in improving standards of work and in the development of techniques and equipment, and makes the necessary inspection to assure compliance with cooperative agreements.

This cooperative program has been actively conducted since 1912. When the program was initiated and Federal leadership given, only 60,779,000 acres of forest land were covered by a nominal form of organized protection on the part of States and private industries. Since that time this area has progressively increased until 252,253,970 acres were given protection during the past year. Under Federal leadership, the cooperating States, together with county and private agencies, have effected unified organizations primarily devoted to the protection of forest lands from fire. Material advances are currently made in organizational procedures and in the development and adaptation of machinery and equipment for this work.

That this cooperation is fruitful of tangible values is evidenced by reports received for the calendar year 1936 which indicate that only 1-1/4 percent of the protected forest area was burned, as compared with nearly 20 percent of the unprotected area which was burned over.

Public leadership and participation in fire protection work is essential. The three cooperating agencies -- Federal, State, and private owner -- each has compelling responsibility, and each is actively participating in this program.

The following table shows by States, the Federal allotments compared with contributions made by States and private agencies for forest-fire cooperative work conducted under the provisions of the Clark-McNary Act.

STATE ALLOTMENT DATA
FOREST-FIRE COOPERATION UNDER SECTION 2 OF THE CLARKE-MCMARY LAW

STATE	1929 estimate to protect State and private forest land	State and private funds budgeted, fiscal year 1938	Federal allotments, fiscal year 1938 (a)
Maine.....	\$342,000	\$210,271	\$42,560
New Hampshire.....	131,000	65,968	13,830
Vermont.....	57,000	18,836	5,620
Massachusetts.....	169,000	102,537	24,430
Rhode Island.....	17,000	18,060	1,820
Connecticut.....	76,000	66,665	11,060
New York.....	378,000	423,932	59,650
New Jersey.....	128,000	129,988	24,310
Pennsylvania.....	364,000	279,010	40,910
Delaware.....	12,000	9,220	1,580
Maryland.....	73,000	57,266	10,220
Virginia.....	397,000	49,590	31,760
West Virginia.....	312,000	148,550	31,070
Kentucky.....	212,000	20,860	12,460
North Carolina.....	632,000	120,389	56,390
South Carolina.....	378,000	111,398	35,110
Georgia.....	775,000	183,887	66,510
Florida.....	847,000	190,096	71,780
Alabama.....	573,000	48,340	45,840
Mississippi.....	563,000	61,905	45,980
Louisiana.....	434,000	106,800	42,900
Texas.....	434,000	92,165	45,530
Oklahoma.....	165,000	20,810	13,200
Arkansas.....	484,000	139,735	42,870
Tennessee.....	245,000	100,897	23,470
Michigan.....	662,000	585,805	92,440
Wisconsin.....	390,000	555,520	62,980
Minnesota.....	697,000	335,910	79,660
Ohio.....	60,000	18,595	5,830
Indiana.....	84,000	32,394	7,840
Illinois.....	77,000	- -	- -
Missouri.....	347,000	- -	- -
Montana.....	190,000	83,859	22,760
Idaho (N).....	420,000	156,502	48,750
Idaho (S).....	27,000	30,551	4,540
South Dakota.....	4,500	3,492	590
New Mexico.....	26,000	6,114	2,180
California.....	969,000	647,174	147,680
Nevada.....	13,600	6,329	1,528
Hawaii.....	5,173	6,682	874
Washington.....	632,000	890,363	87,810
Oregon.....	584,000	473,937	87,595
Total allotments			
to States.....	13,386,273	6,610,402	1,453,917
Administration and contingent expenses			156,090
Forest Taxation and Insurance Project.			45,000
Total appropriation			1,655,007

(a) Estimated allotments for 1939 are the same as for the fiscal year 1938, although actual allotments for 1939 will depend upon State expenditures.

(n) COOPERATIVE FARM FORESTRY
(Formerly "Cooperative Distribution of Forest Planting Stock")

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938.	\$70,579	\$679,256	\$749,835
Budget Estimate, 1939.	<u>1,300,000</u>	<u>---</u>	<u>1,300,000</u>
Net change	+1,229,421	-679,256	+ 550,165

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase or decrease
. Payments to States for cooperative distribution of forest planting stock.	\$69,723	\$70,579	\$100,000	+ \$29,421(1)
. Prairie States forestry project:				
Regular funds.	---	---	1,000,000	+ 1,000,000(2)
ER funds	<u>1,385,132</u>	<u>679,256</u>	<u>---</u>	<u>- 679,256</u>
Total.	<u>1,385,132</u>	<u>679,256</u>	<u>1,000,000</u>	<u>+ 320,744</u>
. Farm forestation and woodland management:				
Regular funds.	---	---	175,000	+ 175,000(3)
. Farm forestry research:				
Regular funds.	---	---	25,000	+ 25,000(4)
<u>Total obligations:</u>				
Regular funds.	69,723	70,579	1,300,000	+ 1,229,421
ER funds	<u>1,385,132</u>	<u>679,256</u>	<u>---</u>	<u>- 679,256</u>
Total.	<u>1,454,855</u>	<u>749,835</u>	<u>1,300,000</u>	<u>+ 550,165</u>
<u>Unobligated balance (regular funds).</u>	856	---	---	---
<u>Total (all funds):</u>				
Regular funds	70,579	70,579	1,300,000	+ 1,229,421(A)
ER funds.	<u>1,385,132</u>	<u>679,256</u>	<u>---</u>	<u>679,256</u>
Total	<u>1,455,711</u>	<u>749,835</u>	<u>1,300,000</u>	<u>+ 550,165</u>

INCREASES

(A) The increase of \$1,229,421 in this item for 1939 is brought about by the passage of the Cooperative Farm Forestry Act approved May 18, 1937. Under this act, the Secretary of Agriculture is authorized, in cooperation with the land grant colleges and universities and State forestry agencies, to carry out a more effective farm-forestry program. This program will be carried forward coordinately by the Extension Service and Forest Service. The Extension Service, as explained in their estimates, will conduct the

educational phases of this forestry work in cooperation with the Forest Service and the land grant colleges. The Forest Service will conduct research and other technical phases of the program beyond the educational phase, including the production, procurement, and distribution of planting stock and work on the Prairie States Forestry Project, in cooperation with State agencies. The increase for 1939 consists of the following items:

(1) An increase of \$29,421 to extend cooperation and permit a much-needed expansion of facilities in the 42 States and 2 Territories which are now cooperating. Provision also will be made for participation by the States of Missouri and Illinois which are expected to qualify for participation during the fiscal year 1939.

Since 1925 the farmers throughout the Nation have become accustomed to securing the trees distributed under this program for windbreak and shelter-strip planting, the volume of requests received annually being far in excess of the available supply of trees. In one of the Southern States, for instance, the requests from farmers for planting stock under the Clarke-McNary cooperative program for 1938 are approximately fifteen times the available supply in the State nursery cooperatively operated to furnish this stock. An increasing public realization of the value of farm woodlands and the increased market for pulpwood in the South, together with the stimulus in tree planting brought about by public programs, has greatly accentuated the requests from farmers for planting stock. An increase in the appropriation for this activity will permit an absorption of part of this expanded demand, which expresses the wish and the hope of the farmer for assistance in developing a steady source of income and of improving the conditions under which he lives.

This cooperation has been and is far-reaching in making trees available to farmers at small cost. Plantations established by the farmers themselves through these projects constitute in most cases the substitution of soil-fixing for soil-eroding practices and have their direct influence in the regulation of run-off, thus contributing to the control of floods.

(2) An increase of \$1,000,000 for Prairie States forestry project. The importance and need of tree growth in the semiarid Great Plains area has long been known. Consistently since 1876 Congress has encouraged tree planting in the prairie States. Recurrent droughts, with attendant crop failures, have imprinted a vivid picture on the mind of every American citizen and have sharply focused the need for restorative measures. The future prosperity of an important agricultural region of considerable magnitude is dependent upon the control of the havoc being wrought by nature. Barriers of trees must be planted to break up the unrestrained sweep of the winds across farmed areas so that the soil may be kept in place, the moisture conserved, and crop production assured.

The evidence is clear that the planting of trees as barriers to the wind makes it possible to conserve moisture and grow crops, in addition to all other benefits inherent in tree growth. The Forest Service during the past three years has adequately demonstrated that

tree plantings made in accordance with proper scientific practices are assured of success. Trees over twenty feet in height in less than three years after planting attest the efficacy of Forest Service plantings. Despite the unprecedented drought conditions, many millions of trees have in the past three years been definitely and firmly established on some 6,500 farms, contributing their part to the rehabilitation of this sorely-distressed area.

Tree-planting work in the Great Plains area is a preventive of future distress and devastation, a measure which applies now will bring economic and social benefits through the years to come, and which, if ignored, will vitiate the rehabilitation and restoration of a fertile area now in acute jeopardy. The stabilized welfare of this area will have an indisputable effect upon the welfare of the whole country, in volving as it does the major part of the so-called "bread-basket" of the Nation.

3. Increase of \$175,000 for farm forestation and woodland management. There are about 185,000,000 acres of woodlands on farms in the United States. They occupy a larger area than any other single crop. Their products contribute directly to the economic income and welfare of more than 2,500,000 farm families in addition to supplying timber, fuel, fence posts and other products for home use.

These woodlands constitute one-third of the Nation's forest land. They are an important factor in flood control and contribute heavily to the supply of raw material for industrial use. Their productive maintenance is an important part of a well-balanced national program of land use.

Acting in conjunction with State Forestry Agencies, the Department proposes to carry on a program of increased production and distribution of forest planting stock by expansion of existing nurseries where possible or by establishment of new ones to meet an existing demand for additional trees to reforest cut-over areas and abandoned fields and to reinforce depleted woodlands.

It proposes, cooperatively with State Forestry Agencies, to aid farmers in more productive and profitable management of existing woodlands by making available the services of foresters to help, beyond the educational phase, in improving planting, cutting, utilization and marketing practices by furnishing technical assistance in making of surveys, marking of trees for felling, estimating of wood volume, etc.

Recently expended markets for forest products in some regions offer splendid opportunity for increased farm woodland income. However, conservative management practices must be followed if farm woods are not to continue to suffer from exploitive overcutting. The proposed program aims to protect the farm forest resource and at the same time provide a reasonable income for the farm woods owner and a continuous supply of raw material for industry.

(4) An increase of \$25,000 for farm forestry research. The success of the entire farm-forestry effort must depend upon a sound technical back-ground which may be effectively obtained only through research. Information is urgently needed as to the best methods of planting and otherwise managing farm woodlands, on the best methods of harvesting, manufacture, and marketing of the products of the farm woodlots, and for the intelligent integration of these processes with the demand for wood products. In these fields research has been almost nonexistent.

CHANGES IN LANGUAGE

The title of this appropriation has been changed from "Cooperative Distribution of Forest Planting Stock" to "Cooperative Farm Forestry".

The following addition to the old appropriation item has been made to carry out the provisions of the Cooperative Farm Forestry Act of May 18, 1937:

"and for Forest Service work incident to carrying out the provisions of the Cooperative Farm Forestry Act (50 Stat. 188), approved May 18, 1937, \$1,200,000, in all, \$1,300,000, which amount shall be available for the employment of persons and means in the District of Columbia and elsewhere."

WORK UNDER THIS APPROPRIATION

General.-- The work under Projects 2, 3, and 4, which follow, is specifically provided for by the Cooperative Farm Forestry Act (50 Stat. 188), approved May 18, 1937, which authorizes the Secretary of Agriculture, in cooperation with the land-grant colleges and universities and State forestry agencies, to produce or procure and distribute forest trees and shrub planting stocks; to make necessary investigations; to advise farmers regarding the establishment, protection, and management of farm forests and forest and shrub plantations and the harvesting, utilization, and marketing of the products thereof; to enter into cooperative agreements; and to lease, purchase, or accept donations of land and develop nursery sites for the production of such forest planting stock as is needed to effectuate the purposes of this Act. This item also provides for the cooperative distribution of forest planting stock under the Clarke-McNary Act, discussed under Project 1.

(1) Payments to States for cooperative distribution of forest planting stock.-- The work under this project consists of active cooperation with the individual States and Territories in the procurement and production of forest-tree seeds and plants and their distribution to farmers for windbreaks, shelter-strips, and reforestation plantings on nonforested and submarginal farm lands. The work is directly administered by the cooperating State agencies, with technical assistance and advice, inspection, and correlation by the Forest Service. Federal cooperation is provided to the State agencies by means of reimbursement after the work has been performed and paid for by the State. In excess of thirty-five million trees were distributed to farmers during the calendar year 1936 under this cooperative plan.

Through these cooperative projects the individual States secure Federal assistance in the form of monetary grants for establishing and maintaining tree nurseries and other sources of procurement of forest planting stock. These facilities are available to the States for participation in tree-planting programs in connection with C.C.C. work, soil and water conservation work, and other tree-planting activities under various work-relief programs, with the reimbursability of Federal funds entirely contingent upon the distribution of tree-planting stock to farmers in accordance with the Clarke-McNary Law.

(2) Prairie States forestry project.-- A program to produce planting stock and, cooperatively with farmers, establish field protective plantings in the Prairie-Plains region is contemplated under this project. This will involve an annual planting program of some 40,000 acres in the form of approximately 3,000 miles of shelter-strips affording protection to 600,000 acres of farm land on a long-time basis. The work as conducted requires cooperation from the landowners benefited, up to approximately 50 percent of the ultimate establishment costs. The farmer is required to furnish the land and do the necessary ground preparation, furnish fencing material, and perform a large part of the cultivation over a period of 2 to 4 years. This work will be handled on a project basis, with efforts concentrated in critical areas within the six States in which plantings have been made. Success achieved in previous plantings, even under emergency labor and drought conditions, has led to the application by many hundreds of local farmers for participation in this cooperative tree-planting program in the Prairie-Plains area.

(3) Farm forestation and woodland management.-- Federal cooperation and leadership must be given in farm forestry work. Acting in conjunction with State agencies, within their respective fields of activity, the Department will initiate and follow through a program designed to increase farm-forest income, aid agriculture and employment, improve living conditions on farms, and advance the general public welfare. Authentic technical information will be made available in the efficient management of farm woodlands. Forest-tree nurseries will be expanded or established to produce satisfactory planting stock at low costs, but only such stock will be produced as is not generally produced and/or sold by commercial nurseries, and no planting stock will be permitted to enter commercial channels. The program will cover the farm woodland territory and may be summed up to include the production and distribution of forest planting stock, plus supervision and inspection of the actual planting and technical assistance in the management of individual farm woodlands, and will be conducted in cooperation with the State Forestry Departments. The cooperative phases of this work will permit a unified approach and attack on a phase of rural economy which is rapidly taking shape as an important stabilizing factor in farm management and rural prosperity.

(4) Farm forestry research.--Intensive studies will be made to determine the most practical and economical methods of planting and managing farm woodlands and of the harvesting, manufacture, and marketing of their products, in order to effect the profitable sustained utilization of these woodlands, an important and much neglected national resource.

(o) ACQUISITION OF LANDS FOR NATIONAL FORESTS

	<u>Regular</u>	<u>Emergency</u>	<u>Total</u>
Appropriation, 1938. . .	\$3,000,000	\$328,800	\$3,328,800
Budget Estimate, 1939. .	<u>1,000,000</u>	<u>- - -</u>	<u>1,000,000</u>
Net change.	<u>-2,000,000</u>	<u>-328,800</u>	<u>-2,328,800</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
Acquisition of land for national forests.....	\$2,364,447	\$2,680,821	\$875,000	-\$1,805,821
Unobligated balance.....	37,500	194,179	- - -	- 194,179
Transferred to the Office of the Solicitor (for legal work).....	98,053	125,000	125,000	- - -
Total, regular funds...	2,500,000	3,000,000	1,000,000	- 2,000,000 (1
ER funds.....	1,655,590	328,800	- - -	- 328,800
Total, all funds.....	4,155,590	3,328,800	1,000,000	- 2,328,800

DECREASE

(1) The Budget estimate provides for a reduction of \$2,000,000 in this item for the fiscal year 1939. The actual decrease in working funds is \$1,805,821 inasmuch as a reserve of \$194,179 has been withheld from expenditure in the current fiscal year. With the \$1,000,000 provided in the 1939 Budget it will be possible to retain the present land-acquisition organization to clean up old cases and to purchase a few areas of outstanding importance.

CHANGE IN LANGUAGE

A proviso has been inserted authorizing the transfer of funds to the Solicitor's Office for legal work in connection with this activity. This proviso has been inserted because of objections raised by the General Accounting Office to the continuation of such transfers under the existing language. Under existing law, all legal work of the Department is under supervision of the Solicitor and the legal work involved in forest-land acquisition has always been financed by transfer or allotment of funds.

WORK UNDER THIS APPROPRIATION

Federal acquisition of forest lands for the protection of the headwaters of navigable streams was inaugurated by the Act approved March 1, 1911 (Weeks Law). Federal purchases of lands primarily for purposes of timber production were first authorized by the Clarke-McNary Act of June 7, 1924. Under these two Acts there have been created 82 national-forest purchase units situated in 30 States and in Puerto Rico. Their gross area is about 52,000,000 acres, of which about 16,500,000 acres have been purchased or are in process of purchase; 2,500,000 acres reserved from the public domain; and 300,000 acres acquired through exchange. Included in these areas are approximately 11,000,000 acres which are classed as non-purchasable, leaving an area of about 21,700,000 acres yet to be purchased within existing purchase units.

The major objective of this work is to place under permanent Federal ownership and management the areas of forest land upon which the maintenance of optimum conditions of tree growth, timber production, and streamflow stabilization is a matter of national importance and can be accomplished only by Federal action, together with the areas necessary for the administration of such lands. Accomplishment of this purpose entails national and State surveys of forest areas and conditions, the specific determination and definition of the areas for which Federal ownership is dictated, determination of all land ownerships within such areas, and the solicitation of offers of sale to the United States; detailed examinations, estimates, cruises, and appraisals of the offered lands to determine their value; negotiations with the owners thereof to obtain options; preparation of detailed reports for review by executive officers and the National Forest Reservation Commission; survey of lands in the regions not covered by public survey; and prosecution of the routine steps incident to the perfection of titles and the final vesting of the land in Federal ownership. Most of the cost of this work is borne by the special appropriations or allotments made available for land purchase but certain of the costs of administrative review and action are properly chargeable against the general expenses of the Forest Service.

(p) ACQUISITION OF LAND, UINTA AND WASATCH NATIONAL FORESTS, UTAH

Appropriation Act, 1938 \$50,000
 Budget Estimates, 1939. 50,000

PROJECT STATEMENT

Project	1937	1938 (Estimated)	1939 (Estimated)
Acquisition of lands in the Uinta and Wasatch National Forests, Utah	\$47,620	\$50,000	\$50,000
Unobligated balance.....	2,380	- - -	- - -
Total appropriation....	50,000	50,000	50,000

WORK UNDER THIS APPROPRIATION

This appropriation is used only for the purchase of land, after approval by the National Forest Reservation Commission. When purchased, the lands are administered as parts of the Uinta and Wasatch National Forests. The purchase price of the land is paid for out of receipts from these two forests.

The land being purchased is located on the western slope of the Wasatch Range in Utah. The greater part of the virgin timber resources of these lands was used to develop the tributary valley. Subsequent fires destroyed or impaired much of the forest cover and, because of their availability as spring and fall ranges, the lands were very heavily stocked with range and domestic livestock. Due to these three causes, the vegetative cover, which once protected the steep slope and held the soil in place, very largely has been destroyed. In consequence of these conditions, soil erosion has been greatly accelerated and heavy rainfall frequently results in torrential floods which carry away enormous volumes of soil and debris and cause heavy destruction to property in the adjoining valleys.

Inasmuch as these lands adjoin lands owned by the Federal Government and administered by the Forest Service, the cost of administering and protecting the purchased lands is small.

(q) PAYMENTS TO STATES AND TERRITORIES, NATIONAL FOREST FUND

Appropriation, 1938 (revised).....	\$1,200,000
Budget Estimate, 1939.....	<u>1,275,000</u>
Increase	<u>75,000</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase
Payments to States and Territories from national-forest fund	\$995,891	\$1,200,000	\$1,275,000	+\$75,000(1)

INCREASE

(1) An additional \$75,000 is included under this fund because of an anticipated increase in national-forest receipts in the fiscal year 1938. It is estimated that the receipts for the fiscal year 1938 will be \$5,100,000.

WORK UNDER THIS APPROPRIATION

The Act of June 20, 1910 requires that 25 percent of all money received from the national forests during any fiscal year shall be paid

to the States and Territories in which the forests are located. The above law further requires that the funds so distributed to the States shall be used for public roads and schools in the county or counties in which the national forests are situated. The amount of this appropriation varies each year in direct proportion to national-forest receipts during the previous fiscal year. Increases in this appropriation are offset by additional revenue to the Federal treasury.

(r) PAYMENTS TO SCHOOL FUNDS, ARIZONA AND NEW MEXICO, NATIONAL FOREST FUND

Appropriation Act, 1938 (revised)...\$30,000
 Budget Estimate, 1939..... 30,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Payments to school funds, Arizona and New Mexico, . national-forest fund.....	\$31,685	\$30,000	\$30,000

WORK UNDER THIS APPROPRIATION

At the close of the year there is paid to the States of Arizona and New Mexico an amount equivalent to such proportion of the gross proceeds of all the national forests within these States as the area of land granted to the States for school purposes within the national forests bear to the total area of all national forests within the States. These payments are required by the Act of June 20, 1910 (36 Stat. 562 and 573), which provides "That the grants of Sections two, sixteen, thirty-two and thirty-six to said State, within national forests now existing or proclaimed, shall not vest the title to said section in said State but said granted sections shall be administered as a part of said forests, and at the close of each fiscal year there shall be paid to the Secretary of State, as income for its common-school fund, such proportion of the gross proceeds of all the national forests within said State as the area of lands hereby granted to said State for school purposes which are situated within said forest reserves may bear to the total area of all the national forests within said State the amount necessary for such payments being appropriated and made available annually from any money in the Treasury not otherwise appropriated".

(s) ROADS AND TRAILS FOR STATES, NATIONAL FOREST FUND

Appropriation Act, 1938	\$400,000
Budget Estimate, 1939.....	<u>510,000</u>
Increase.....	<u>\$110,000</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase
Roads and trails for States, national-forest fund.....	\$427,599	\$400,000	\$510,000	\$110,000
Expended from prior year appropriations.....	-77,599	- - -	- - -	- - -
Total appropriations.	350,000	400,000	510,000	110,000

INCREASE

(1) An additional \$110,000 is estimated under this fund for 1939 because of anticipated increased national forest receipts in the fiscal year 1938.

WORK UNDER THIS APPROPRIATION

The Act of March 4, 1913 requires that 10 percent of all moneys received from the national forests during each fiscal year is available at the end thereof to be expended by the Secretary of Agriculture for the construction and maintenance of roads and trails within the national forests in the States from which such proceeds are derived. This fund is expended by the Forest Service on national forests within the States in which receipts were collected.

(t) COOPERATIVE WORK, FOREST SERVICE
(Trust account)

Appropriation Act, 1938..... \$1,000,000
Budget Estimate, 1939..... 1,000,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Construction of improvements....	\$496,318	\$407,000	\$407,000
2. Maintenance of improvements....	41,234	40,000	40,000
3. Prevention of suppression of forest fires.....	345,716	340,000	340,000
4. Brush and other debris dis- posal from timber-sale operations.....	127,158	130,000	130,000
5. Forest investigations for other agencies.....	20,571	50,000	50,000
6. Administration of privately- owned lands.....	15,578	15,000	15,000
7. Reforestation.....	8,017	8,000	8,000
8. Refunds to cooperators.....	17,329	10,000	10,000
Total appropriation.....	1,071,921	1,000,000	1,000,000

WORK UNDER THIS APPROPRIATION

Contributions are made to the Forest Service by individuals, communities, and associations for improvement work, fire control, forest investigations, slash disposal of timber-sale areas, and administration of privately owned land within national-forest boundaries and are deposited to this fund. Expenditures are controlled by the Forest Service.

A. AGRICULTURAL ADJUSTMENT ADMINISTRATION

ALLOTMENTS

Projects	Obligated, 1937	Estimated obligations, 1938	Estimated obligations, 1939
<u>Conservation and Use of Agri- cultural Land Resources:</u>			
For examination of privately- owned range land in con- nection with range-conserva- tion program; for field administration of naval- stores conservation program; and for aerial photography....	\$470,797	\$440,727	\$440,727

B. EMERGENCY FUNDS

(1) Direct Allotments

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Public Works Allotments (National Industrial Recovery Act):</u>		
Construction of improvements other than road and trails	\$10,257	- -
Add amounts used to supplement regular appropriation "National Forest Protection and Management" for:		
Planting on national forests.....	2,381	- -
Reconnaissance	482	- -
Total supplementing regular funds	2,863	- -
Total, Public Works Allotment (N.I.R.).....	13,120	- -
<u>Emergency Relief Appropriation Act of 1935:</u>		
(a) Administrative expenses in connection with miscellaneous forestry projects (Includes \$81,171 for administrative expenses, Acquisition of Lands).	214,981	- -
(b) Miscellaneous forestry activities, including:		
National-forest improvements, etc.	661,614	- -
Acquisition of additional forest lands.....	218,443	- -
Prairie States forestry project	130,325	- -
Forest research.....	102,162	- -
Total, miscellaneous forestry activities (item b)	1,112,544	- -
(c) Administrative expenses incident to acquisition of forest lands	5,976	- -
(d) Acquisition of additional forest lands.....	1,350,000	- -
Total, Emergency Relief, 1935	2,683,501	- -
<u>Emergency Relief Appropriation Act of 1936:</u>		
(a) Administrative expenses in connection with miscellaneous forestry projects (Includes \$328,800 for administrative expense, acquisition of lands in 1938).....	494,632	\$361,467
(b) For development of public camping grounds.....	2,506,743	- -
(c) For conservation of forest resources	12,479,097	- -
(d) For surveys, examinations and investigations	1,407,212	- -
Total, Emergency Relief, 1936	16,887,684	361,467

(b) (c) (d) The foregoing \$16,393,052 of "project funds" (i.e., exclusive of amount for administrative expenses) has been allocated by States, Alaska, Puerto Rico, and the District of Columbia as follows:

<u>States, etc.</u>	<u>Allotments</u>	<u>States, etc.</u>	<u>Allotments</u>
Alabama	94,129	Nebraska.....	\$379,686
Arizona	915,172	Nevada	228,881
Arkansas	299,379	New Hampshire.....	167,255
California.....	1,689,404	New Jersey	7,672
Colorado	1,080,051	New Mexico	702,946
Connecticut	7,504	New York	4,166
District of Columbia.....	22,891	North Carolina.....	240,430
Florida	111,500	North Dakota.....	257,229
Georgia	238,136	Ohio	78,827
Idaho	1,227,263	Oklahoma	245,883
Illinois.....	75,368	Oregon.....	900,039
Indiana	60,049	Pennsylvania.....	280,861
Iowa	38,692	South Carolina.....	50,036
Kansas	194,535	South Dakota	386,711
Kentucky	128,234	Tennessee.....	128,907
Louisiana	103,349	Texas	254,750
Maine.....	15,634	Utah	1,087,718
Maryland.....	9,740	Vermont.....	76,203
Massachusetts.....	10,377	Virginia	232,185
Michigan	279,841	Washington.....	886,149
Minnesota	324,879	West Virginia	169,294
Mississippi	54,483	Wisconsin	562,229
Missouri	709,397	Wyoming	458,146
Montana	973,822	Alaska	48,829
		Puerto Rico	14,191
		Total.....	<u>16,393,052</u>

<u>Projects</u>	<u>Estimated obligations, 1938</u>
<u>4. Emergency Relief Appropriation Act of 1937:</u>	
(a) Administrative expenses in connection with miscellaneous forestry projects	\$175,000
(b) For development of public camping grounds	935,810
(c) For conservation of forest resources	3,253,800
(d) For surveys, examinations and investigations	<u>289,400</u>
Total, Emergency Relief, 1937.....	<u>4,654,010</u>

(b) (c) (d) The foregoing \$4,479,010 of "project funds" (i.e., exclusive of amount for administrative expenses) has been allocated to States and the District of Columbia as follows:

<u>States, etc.</u>	<u>Allotments</u>	<u>States, etc.</u>	<u>Allotments</u>
Alabama	\$26,583	Nevada	75,100
Arizona	186,884	New Hampshire	5,150
Arkansas	83,200	New Jersey	3,150
California	446,150	New Mexico.....	189,750
Colorado	235,900	North Carolina.....	78,183
Connecticut	2,150	North Dakota.....	91,733
District of Columbia.....	8,600	Ohio	8,600
Florida	35,900	Oklahoma.....	158,384
Georgia	57,400	Oregon	249,950
Idaho	340,100	Pennsylvania.....	52,450
Illinois	14,333	South Carolina.....	10,817
Indiana	10,750	South Dakota.....	137,753
Iowa	3,583	Tennessee.....	40,917
Kansas	133,300	Texas.....	164,900
Kentucky	64,350	Utah.....	281,050
Louisiana	28,017	Vermont.....	15,050
Maine	2,150	Virginia.....	56,750
Maryland.....	2,150	Washington.....	239,200
Massachusetts.....	4,300	West Virginia.....	48,150
Michigan.....	50,225	Wisconsin.....	108,275
Minnesota.....	54,883	Wyoming	118,233
Mississippi.....	17,267	Total allocations	4,429,010
Missouri.....	142,760	Reserve for contin-	
Montana.....	207,950	gencies	50,000
Nebraska.....	137,600	Total.....	4,479,010

WORK UNDER DIRECT EMERGENCY ALLOTMENTS

These allotments are used for such projects as the construction and maintenance of firebreaks, forest-fire lookout houses, towers and observatories, landing fields, telephone lines, forest roads and trails, housing for forest officers, miscellaneous buildings and structures, planting, maintenance of tree nurseries, thinning of forest stands, fire prevention and control, fire-hazard reduction, construction and maintenance of improvements for recreational use of the forests, control of tree-destroying insects and diseases and of range-destroying rodents, eradication of poisonous range plants and revegetation of depleted ranges, construction and maintenance of range fences and other range improvements; surveys of forest resources such as timber, forage, water, wildlife, and related activities; surveys needed for forest activities, power-resource evaluation and appraisal, development of the fish and game resources; studies relating to forest, range, and watershed management, protection, development, and utilization; and for other work and the purchase of equipment and supplies incident to or necessary in connection with any projects of the character indicated above.

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(2) Indirect Allotments
 (Projects financed through other Government agencies)

Civilian Conservation Corps (authorized by Acts of March 31, 1933, April 8, 1935, and June 28, 1937; allotment through War Department):

1. <u>Civilian Conservation Corps Work on</u>	<u>1937</u>	<u>1938</u>
<u>National Forests</u> (includes a small		(estimated)
number of miscellaneous camps).....	<u>\$25,193,693</u>	<u>\$18,887,000</u>

The number of camps on national forests on July 1, 1936, and July 1, 1937 (all camps on national forests unless otherwise indicated) were:

	<u>July 1, 1936</u>	<u>July 1, 1937</u>
Alabama.....	5	5
Tennessee Valley Authority.....	5	5
Arizona.....	13	11
Arkansas.....	14	14
California.....	49	49
Colorado.....	11	12
D. C.	1	1
Florida	7	5
Georgia.....	10	9
Idaho	30	32
Illinois.....	8	6
Indiana.....	3	3
Iowa.....
Kentucky.....	8	8
Louisiana.....	9	6
Maine.....	1	1
Maryland (Navy).....	1	1
Michigan.....	43	32
Minnesota.....	27	20
Mississippi.....	17	15
Missouri.....	12	11
Montana.....	12	14
Nebraska.....	1	1
Nevada	3	2
Navy	2	1
New Hampshire.....	10	6
New Mexico.....	8	8
North Carolina.....	17	14
Tennessee Valley Authority.....	2	2
Ohio	4	4
Oklahoma.....	1	1
Oregon.....	17	17
Oregon and California R.R. lands....	3	3
Pennsylvania.....	8	6
South Carolina.....	8	8
South Dakota.....	11	10

	<u>July 1, 1936</u>	<u>July 1, 1937</u>
Tennessee	12	8
Tennessee Valley Authority.....	16	15
Texas.....	9	9
Utah.....	12	11
Vermont.....	4	4
Virginia.....	13	14
Tennessee Valley Authority.....	3	2
Washington.....	18	19
Navy	1	..
West Virginia.....	13	13
Wisconsin.....	26	18
Wyoming.....	<u>10</u>	<u>11</u>
Total camps.....	<u>518</u>	<u>467</u>
 Total, national-forest camps.....	 485	 438
Total, Navy camps.....	4	2
Total, Oregon and California R.R. land camps	3	3
Total Tennessee Valley Authority camps...	<u>26</u>	<u>24</u>
 Total.....	 <u>518</u>	 <u>467</u>

WORK UNDER THIS ALLOTMENT

This allotment is used for the pay of supervisory and facilitating personnel necessary for the field work done from C.C.C. camps mainly on the national forests; also for the purchase of necessary equipment and construction materials and for miscellaneous expenses incident to the field work of the camps. The field work on the national forests includes the construction of physical improvements needed for the protection and administration of the forests, tree planting, thinning of young stands of timber, destruction of undesirable timber species, rodent control, etc.

	<u>1937</u>	<u>1938</u>
2. <u>Civilian Construction Corps Work</u>		(estimated)
<u>in Alaska</u>	<u>\$414,000</u>	<u>\$774,000</u>

WORK UNDER THIS ALLOTMENT

This allotment (Alaska) is used for pay and allowances to dependents of enrolled members of the Civilian Conservation Corps and for salaries and wages of extra supervisory and clerical personnel needed in connection with the work. It is also used for the purchase of clothing, subsistence, supplies, and camp equipment required for enrolled men of the Corps and for the purchase of construction materials used in the work. Classes of work done under this allotment include construction of trails, minor roads, bridges, water development and improvement, and miscellaneous administrative improvements; roadside clearings and public campground improvement; estimating timber resources; and other miscellaneous work. The men engaged in the work are recruited from the unemployed local residents without regard to age.

	<u>1937</u>	<u>1938</u> (estimated)
5. <u>Civilian Conservation Corps Work on State,</u> <u>Municipal, and Privately Owned Land.....</u>	<u>\$16,676,869</u>	<u>\$11,133,000</u>

Number of camps by States on July 1,
1936 and July 1, 1937:

	<u>July 1, 1936</u>	<u>July 1, 1937</u>
Alabama	4	4
Arkansas	7	6
California.....	9	10
Colorado
Connecticut	16	11
Delaware.....	7	6
Florida	10	8
Georgia.....	12	8
Idaho	6	6
Illinois.....	7	7
Indiana.....	20	18
Iowa	6	8
Kansas	2	..
Kentucky.....	11	11
Louisiana.....	16	13
Maine.....	9	7
Maryland.....	18	14
Massachusetts	21	17
Michigan.....	22	17
Minnesota.....	14	12
Mississippi.....	3	3
Missouri.....	9	9
Montana.....	1	1
New Hampshire.....	6	4
New Jersey	22	19
New York.....	49	43
North Carolina.....	7	7
Ohio.....	19	16
Oklahoma.....	2	2
Oregon.....	9	9
Pennsylvania.....	75	56
Rhode Island.....	4	4
South Carolina.....	8	8
South Dakota.....	1	1
Tennessee	6	4
Texas.....	8	8
Vermont.....	12	9
Virginia.....	24	24
Washington.....	8	8
West Virginia.....	14	12
Wisconsin.....	19	15
Total camps on State lands, etc.	<u>523</u>	<u>445</u>

WORK UNDER THIS ALLOTMENT

This allotment is used for the payment of expenses incurred by States in the conduct of Civilian Conservation Corps work on State, municipal, and privately owned lands, including the purchase of supplies, materials, and equipment used in the work, for payment of salaries and wages of supervisory personnel directing the work of the enrolled men, and for other necessary expenses incident to the work.

The work being accomplished under this allotment includes the protection of State and private forest land from fire by construction of firebreaks, lookout towers, communication systems, truck trails, tool sheds, guard houses, and the fighting of forest fires; protection of State and privately owned forests from the epidemic spread of forest insects and tree diseases; forest cultural measures to improve the forest growth on State-owned lands; and the construction of simple dams and the planting of trees, grass, etc., for the control of erosion and flash run-off at the headwaters of streams.

	<u>1937</u>	<u>1938</u> (estimated)
4. <u>Civilian Conservation Corps Work in</u>		
<u>Puerto Rico</u>	<u>\$1,028,700</u>	<u>\$1,026,000</u>

WORK UNDER THIS ALLOTMENT

This allotment (Puerto Rico) is used for the payment of authorized enrollees and the supervisory personnel engaged in the technical direction of the work projects on the Luquillo National Forest and the insular forests and for the purchase of equipment and supplies incident to the work.

The work projects comprise the construction and maintenance of roads and trails, production of nursery stock, making new and thinning old forest plantations, forest thinnings to improve the timber stands within the national and insular forests, and development of a recreational area within the national forest. With a population of 1,500,000, the unemployment situation in Puerto Rico has been acute and, since the enrollment of the 1,200 men has been on a pro rata basis from the 72 insular municipalities, the C.C.C. work has played its part in giving a measure of relief. Camps are not established as they are in the States, since a large proportion of the enrollees live at home and go to and from the work projects.

A.A.A. ALLOTMENTS AND EMERGENCY FUNDS - BUREAU TOTAL
(Direct allotments)

Summary

Projects	Obligated, 1937	Estimated obligations, 1938	Estimated obligations, 1939
Conservation and Use of Agricultural Land Resources:			
Range-land and naval-stores conservation programs, etc.	\$470,797	\$440,727	\$440,727
Public Works Allotments (National Industrial Recovery Act):			
Construction of improvements other than roads and trails	10,257	- - -	- - -
Amounts supplementing regular appropria- tions	2,863	- - -	- - -
Total, P.W.A.	13,120	- - -	- - -
Emergency Relief Appropriation Act of 1935:			
Miscellaneous forestry activities and administrative expenses incident thereto..	1,327,525	- - -	- - -
Acquisition of forest lands, including administrative expenses	1,355,976	- - -	- - -
Total, Emergency Relief Approp- riation Act, 1935	2,683,501	- - -	- - -
Emergency Relief Appropriation Act of 1936:			
Development of campgrounds, conservation of forest resources, survey, examinations, investigations and administrative ex- penses incident thereto	16,887,684	361,467	- - -
Emergency Relief Appropriation Act of 1937:			
Development of campgrounds, conservation of forest resources, survey, examinations, investigations, and administrative ex- penses incident thereto	- - -	4,654,010	- - -
Total, A.A.A. and Emergency Funds	20,055,102	5,456,204	440,727

Indirect Allotments (Civilian Conservation Corps
Work, financed by War Department)

Projects	Obligated, 1937	Estimated obligations, 1938
Activities of Civilian Conservation Corps:		
National forests (and miscellaneous)	\$25,193,693	\$18,887,000
Alaska	414,000	774,000
State, municipal, and privately owned lands...	16,676,869	11,133,000
Puerto Rico.....	1,028,700	1,023,000
Total, Indirect Allotments (CCC).....	43,313,262	31,820,000

PASSENGER-CARRYING VEHICLES

The Budget estimate provides for a reduction of \$3,272 in the authorization for the purchase of passenger-carrying vehicles for the Forest Service from all appropriations other than Forest Roads and Trails. The amount estimated (\$57,915) will permit the needed replacement of 81 vehicles at an average cost of \$632, when exchange allowances are taken into account, and the purchase of 9 additional vehicles at an average cost of \$750.

Of the 9 additional vehicles, 5 will be used in the Northern Rocky Mountain National Forest Region and are, in effect, replacements of existing vehicles. The old vehicles will not be traded in on the new purchases but will be used by forest guards on patrol routes in fire-control work. The old vehicles have deteriorated to the point where they are not satisfactory for ordinary travel but can be used advantageously on forest-fire road patrol. It is the practice to employ forest guards and to require them to furnish cars for patrol purposes. It has become increasingly difficult to employ temporary men who have the proper automotive equipment for this purpose.

Four new vehicles will be purchased from the new appropriation "Cooperative Farm Forestry" for service on the Prairie States Forestry Project. These vehicles will be used by members of the staff at Lincoln, Nebraska, for travel over the project, which extends from the Canadian Line to northern Texas. Most of the common carriers in this territory run in an east and west direction, making it impossible to travel by this means in an economical and expeditious manner.

It is estimated that the average mileage of the cars to be replaced as of June 30, 1938, will be in the neighborhood of 50,000 miles.

The authorization under Forest Roads and Trails has also been reduced to \$7,087. This amount will permit the replacement of eleven vehicles at a net average cost of \$645 when exchange allowances are taken into account.

BUREAU OF CHEMISTRY AND SOILS

(a) SALARIES AND EXPENSES -- PREAMBLE

Changes in Language

The Budget estimates provide for elimination of the words "all necessary expenses connected with the" and "rent outside the District of Columbia, and other necessary supplies and expenses" as superfluous language, since the general authority "for the employment of necessary persons and means in the City of Washington and elsewhere" is believed to cover the requirements. This change will make the paragraph conform to the more generally accepted phraseology used elsewhere in the Appropriation Act.

(b) GENERAL ADMINISTRATIVE EXPENSES

Appropriation Act, 1938.....	\$90,241
Budget Estimate, 1939.....	<u>90,200</u>
Decrease.....	<u><u>41</u></u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
General administration and business service.....	\$89,631	\$90,241	\$90,200	- \$41 (1)
Unobligated balance.....	610	- - -	- - -	- - -
Total appropriation.....	90,241	90,241	90,200	- 41

DECREASE

(1) A decrease of \$41 is submitted in this item for 1939.

WORK UNDER THIS APPROPRIATION

This appropriation provides for the salaries and expenses of the office of the Chief of Bureau and for the administrative units of business management, information, audits and bookkeeping, estimates and reports, personnel, equipment and supplies, files, and miscellaneous services and records.

(c) AGRICULTURAL CHEMICAL INVESTIGATIONS

Appropriation Act, 1938.....	\$360,260
Budget Estimate, 1939.....	352,500
Decrease.....	<u>7,760</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. Cereals, fruits, vegetables, etc., investigations.....	\$161,296	\$156,642	\$152,648	-\$3,994 (1)
2. Sugars, starches, and fats investigations....	79,804	80,084	78,280	- 1,804 (1)
3. Protein and vitamin investigations.....	27,946	28,451	27,960	- 491 (1)
4. Fundamental investigations in chemistry, microbiology, and pharmacology relating to agricultural products..	70,458	75,083	74,092	- 991 (1)
5. Chemical weed eradication investigations...	19,442	20,000	19,520	- 480 (1)
Unobligated balance.....	1,314	- - -	- - -	- - -
Total appropriation....	360,260	360,260	352,500	- 7,760 (1)

DECREASE

(1) A decrease of \$7,760 is submitted in this item for 1939, distributed by projects as indicated in the foregoing statement. The \$1,804 reduction under Project 2, "Sugars, starches, and fats investigations," includes \$180 due to saving in rent of laboratory quarters at Houma, La., made possible by provision of space in a new general laboratory building being constructed there during the present fiscal year under a Bureau of Plant Industry appropriation.

WORK UNDER THIS APPROPRIATION

General.—The purpose of the research work under this appropriation is to widen the markets for farm products through the development of more extensive uses, chiefly for food and feed purposes; to improve the quality and to better adapt the products to market requirements; to discover uses for the constituents of hitherto unutilized plants and new uses for minor crops which will lead to their production on land now utilized for over-produced crops; to develop and substitute domestic for imported agricultural products; to reduce losses from spoilage and deterioration of food and other agricultural products; and to develop methods for the disposal of wastes from food manufacturing plants. This work involves fundamental research on the chemical nature of the numerous organic and inorganic constituents of agricultural products, and technological application of the knowledge thus acquired to the solution of practical problems of utilization.

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Investigations are conducted on the chemistry, technology, processing, and utilization of cereals, fruits, and vegetables, on carbohydrate crops and products (sugars, starches, and miscellaneous carbohydrates), oils, fats, and waxes, and on proteins and vitamins. Fundamental investigations involving chemical, biochemical, microscopic, and microbial studies are conducted on foodstuffs in all phases of their evolution from food plants and raw materials to the finished manufactured products. Studies are also being conducted on problems dealing with the production and use of chemicals for the control of noxious weeds.

1. Investigations of Cereals, Fruits, Vegetables, etc.--Work under this project is directed toward increasing the efficiency of recognized methods and developing new methods in the processing and preservation of food products, in the prevention of spoilage, and in the utilization of culls, surpluses, and wastes for the manufacture of food and other products. Cereal investigations include the study of problems in milling, baking, and malting, with special reference to improving quality of cereal products and the reduction of large losses from spoilage such as is caused by staling and rancidity. Fruit and vegetable investigations are concerned with the various types of food preservation, economical utilization of culls and crop surpluses, and the development of valuable byproducts. The portion of the fruit crop graded as culls often constitutes from twenty to thirty percent of the total crop and represents that much loss unless methods of profitable utilization are developed. In years of over-production the disposal of surplus products in the form of byproducts also acts to stabilize the fresh market. One of the present problems of outstanding importance to the fruit industry is the satisfactory preservation of fruit juices. The quality of fruit suitable for juice extraction is not suitable for direct sale, yet is highly palatable and of great dietary and commercial value. Of similar importance is the preservation of fruit pulp by freezing. Investigations are also conducted to improve processes for making pickles, vinegar, and allied products. Foods and food products with a value of more than \$3,000,000,000 come within the field served by this project. It is the aim of the work to increase this valuation by expanding the processing of farm products, thereby extending the market for raw materials and adding to the farm price.

2. Sugars, Starches and Fats Investigations.-- This work consists of chemical and technological research on the carbohydrate constituents of crops and derived farm products (such as sugarcane, sugar beets, honey, maple products, farm-made sugarcane and sorghum sirup, sweet and white potatoes and other starchy plants, and plants containing miscellaneous carbohydrates) and on fats, oils, and waxes. The object of this work is to increase farm income from these crops and their derived products by promoting wider and more profitable markets through improving the quality and increasing the utilization of their carbohydrate constituents. Investigations are conducted under this project to determine the identity, properties, and content of the carbohydrate constituents; to ascertain the factors which influence yield and quality of these constituents and derived products; to develop measures which will insure better and more uniform quality and better adaptation to market requirements; to originate new and diversified uses for carbohydrates; to increase the commercial use of minor crops; and to find means of utilizing uncultivated plants with the view of developing new and valuable crops for diversification. The work on oils, fats, and waxes - products which represent a value to the people of this country of over \$2,000,000,000 - is directed toward obtaining new and more accurate data on their characteristics, composition, and properties so they may be produced, refined, and utilized to the best advantage from the standpoint of the producer, the processor, and the consumer.

3. Protein and Vitamin Investigations. -- Under this project chemical and biological investigations are made of the nutritive value of foods and feeds with particular reference to their protein and vitamin content, two of the most highly important elements in human and animal nutrition. Proteins differ greatly in their food value. They are complex compounds made up of over twenty constituents called amino acids. The digestibility of a protein depends on its structure. Exact information on the amino acid composition of proteins is meager and fragmentary. The investigations being conducted include isolation of the proteins from raw materials, determination of their properties, composition, and digestibility, studies on methods of analysis of proteins and their constituent amino acids, and studies on the nature and extent of changes that occur in the chemical and nutritional value of the proteins of grains, seeds, and their meals on storage and aging. Extension of our knowledge of the chemistry of proteins is important to the farmer as it gives him the basis for the most efficient feeding of farm animals and for the economic utilization of his crops. It is also essential for a determination of the use of proper human diet to maintain health and efficiency; for the right curative and preventive treatment of those suffering from allergic disturbances; for the development of technological uses of proteins in industry; and for advancement in the fields of enzymes, serums, antitoxins, and immunization. Investigations of vitamins include a study of methods and technique of vitamin assay and studies of the effects upon vitamins of certain commercial processes used in the manufacture of food products.

4. Fundamental Investigations in Chemistry, Microbiology, and Pharmacology Relating to Agricultural Products. -- This project involves chemical, biochemical, microscopic, and microbial studies of foodstuffs in all phases of their evolution to finished manufactured products. It is the purpose of this work to conduct specific fundamental studies which, because of their nature, can not be undertaken either by the individual food manufacturers or food organizations. Among the more important lines of work being conducted are the following: Research on the microbial spoilage of preserved foods - a phenomenon of widespread occurrence and of special importance now because of the rapid development of new processes for preserving foods; determination of the toxic effects which may result from consumption of human foods containing naturally occurring or artificially added ingredients, as antimony and cadmium; the pharmacology of naturally occurring ingredients in foods, as naringin and hesperidin in citrus fruits; isolation and identification of special constituents of plants and plant products that appear to be of special value in nutrition or in the arts - for example, the ursolic acid of apple pomace and other fruit waste; studies of the color formation of apples and the deterioration of color in tomatoes - factors having an important bearing on the value of the products; and research on the nature of various enzymic actions and their relation to growth, spoilage, curing, and preservation of agricultural products. A proper understanding of the factors responsible for the biochemical changes in food plants and products is essential in preventing losses occurring in the growing, handling, storing, processing, and consumption of farm products and also has direct application in the improvement of processes which will enhance the quality and edibility of these products, with resultant increase in their uses and in the returns to the farmers.

5. Chemical Weed Eradication Investigations. -- Work done under this project is directed toward the development of chemical means for the elimination of the bindweed and other noxious weeds. Weeds cost the American farmer serious loss annually through reduction of crop yields and quality and through increased cost of farm operations. Present investigations include (a) study of the economics and methods of manufacture of recognized chemical agents for the eradication of

noxious weeds, with a view to reducing the cost of these chemical agents to the farmer; and (b) the preparation of new chemicals suitable for use as herbicides. All work under this project is done in cooperation with the Bureau of Plant Industry.

(d) INDUSTRIAL UTILIZATION OF FARM PRODUCTS AND BY PRODUCTS

Appropriation Act, 1938.....	\$196,243
Budget Estimate, 1939.....	191,200
Decrease.....	<u>5,043</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
Industrial Utilization of Farm Products and Byproducts:				
(a) Hides and skins investigations.....	\$10,287	\$12,517	\$12,207	-\$310 (1)
(b) Tanning materials and tanning processes investigations.....	13,700	16,700	16,283	- 417 (1)
(c) Leather investigations..	7,536	7,816	7,621	- 195 (1)
(d) Wastes investigations..	34,868	34,868	34,000	- 868 (1)
(e) Biological stain investigations.....	6,384	500	486	- 14 (1)
(f) Fermentation inves- tigations.....	66,095	59,425	58,549	- 376 (1)
(g) Lignin investigations..	9,650	12,500	12,187	- 313 (1)
(h) Chemical conversion of oils, fats, and waxes.	20,033	25,917	24,517	- 1,400 (1)
(i) Plastics investigations	1,000	11,000	10,725	- 275 (1)
(j) Motor fuels from agri- cultural products.....	- - -	15,000	14,625	- 375 (1)
Unobligated balance.....	1,690	- - -	- - -	- - -
Total appropriation.....	171,243	196,243	191,200	- 5,043 (1)

DECREASE

(1) A decrease of \$5,043 is submitted in this item for 1939, distributed by projects as indicated by the above statement.

WORK UNDER THIS APPROPRIATION

The work under this appropriation is concerned with the industrial utilization of farm products, byproducts, wastes, and surpluses through the application of chemical, physical, and technological methods, including the changes produced by micro-organisms such as yeasts, bacteria, molds, and fungi. The work com-

prises studies relating to the conservation of hides and skins through the development of improved methods of tanning; the serviceability of leather; the development of new sources of tanning materials to supplement our dwindling national supplies, and the study of methods of application of such materials; the industrial utilization of the 260,000,000 tons of straw, cornstalks, hulls, and similar agricultural byproducts now produced annually, for the manufacture of paper, pressboard, pulp, industrial cellulose and its derivatives, etc.; the utilization of agricultural wastes and surpluses; research in the chemistry of lignin to provide an outlet for the 40,000,000 tons of this material now produced annually; the development and standardization of biological stains required in the study of plant and animal diseases and all biological research; the study of the production of derivatives of oils, fats, and waxes, with a view to their utilization in industry; the study of the production of synthetic resins and plastics from agricultural raw materials; and the employment of micro-organisms in the production of valuable substances from agricultural crops and byproducts, including studies on the factors involved in the production of industrial alcohol from renewable sources of raw materials.

Our national economic situation relative to agriculture indicates the need for the utilization of farm products for purposes other than food and clothing. Research conducted under this appropriation points the way to this end and widens the farmers' markets by opening up to agricultural products fresh fields of utilization. Industrial experience has definitely shown that the recovery and utilization of byproducts or waste products are vital functions of any successful business enterprise. Agriculture, to be successful, cannot afford to ignore the technique of industry nor disregard the presence of numerous and varied byproducts. The direct utilization or conversion of these materials into revenue-producing commodities is a problem which must be continuously and diligently studied to strengthen the economic status of present day agriculture.

(e) AGRICULTURAL FIRES AND EXPLOSIVE DUSTS

Appropriation Act, 1938.....	\$48,403
Budget Estimate, 1939.....	<u>47,500</u>
Decrease.....	<u>903</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
<u>Agricultural Fires and Explosive Dusts:</u>				
(a) Agricultural fires.....	\$13,265	\$13,522	\$13,300	- \$222 (1)
(b) Explosive dusts.....	32,281	34,881	34,200	- 681 (1)
Unobligated balance.....	2,857	- - -	- - -	- - -
Total appropriation.....	48,403	48,403	47,500	- 903 (1)

DECREASE

(1) A decrease of \$903 is submitted in this item for 1939, distributed by projects as indicated in the foregoing statement.

WORK UNDER THIS APPROPRIATION

Work under this appropriation includes studies of dust explosions and explosion hazards in grain-handling operations and in industrial plants handling products of agricultural origin, experimental chemical research and development work on the prevention of dust explosions and resulting fires, and the practical application of the results of this research. Special attention is being given to the development of safety codes for dust-explosion prevention. Chemical and engineering research is also conducted on the causes of self-heating of agricultural products and on the development of equipment and methods for the prevention and control of farm fires. Active cooperation is carried on with farm organizations, agricultural experiment stations, industrial companies, insurance organizations, State commissions, fire-prevention associations, safety organizations, and other interested agencies in the practical application of the results of this research work and in the preparation of protective measures. These investigations are directly concerned with saving human life and property, and the research work is directly associated with the development of safety measures in the more efficient utilization of agricultural products. Increased industrial operations and the utilization of byproducts and waste materials resulting in the production and accumulation of large quantities of explosive dusts have greatly increased the hazards. With practically every new development for the utilization of agricultural products it is necessary to work out new methods for protection from dust explosions and agricultural fires.

(f) NAVAL-STORES INVESTIGATIONS

Appropriation Act, 1938.....	\$81,400
Budget Estimate, 1939.....	79,400
Decrease.....	<u>2,000</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
<u>Naval-Stores Investigations:</u>				
(a) Naval-stores production, processes, and equipment.....	\$41,311	\$43,470	\$41,470	- \$2,000
(b) Composition, properties, components, and derivatives of naval stores..	21,145	17,784	17,784	- - -
(c) Uses, handling, and transportation of naval stores.....	16,154	20,146	20,146	- - -
Unobligated balance.....	631	- - -	- - -	- - -
Total appropriation.....	79,241	81,400	79,400	- 2,000 (1)

DECREASE

- (1) A decrease of \$2,000 is submitted in this item.

WORK UNDER THIS APPROPRIATION

The purpose of the work under this appropriation is to improve agricultural-chemical-technological practices, processes, and equipment for the production of turpentine, rosin, and related products, so as to prevent deterioration and waste, reduce costs of production, and obtain products of better quality; to promote the utilization of turpentine and rosin and related products through fundamental studies of their chemical composition and properties; and, through applied chemical research, to develop processes and equipment for improving established products and to expand present and develop new uses for oleoresins, turpentines, and rosins, needed to absorb current production and the inevitable increase that will occur within a few years. More than 20,000 farmers in the South are producing turpentine gum, and of these about 2,000 have stills for the separation of gum into turpentine and rosin. Approximately 60,000 people are employed in naval-stores production and distribution. The average annual value of naval stores is approximately \$40,000,000. Naval stores are important day-to-day cash crops of the South, affording a living to more than 300,000 persons in an area 70 percent of which is devoted to the growth of forests and providing the major business of large areas in the South. Today's average annual production of naval stores is approximately 600,000 fifty-gallon casks of turpentine and 2,500,000 500-pound barrels of rosin, with an assured potential production through voluntary re-growth of pine timber of three times as much within 25 years. It is only by reducing costs of production and by increasing consumption through new uses of naval stores that this large number of people may be afforded a living. The rational use of land, through land-use adjustment, is a major problem in Southern agriculture. These investigations on naval stores bring greater returns to the turpentine farmer and have a direct bearing on the economic maintenance of the pine forests of the South, thus also helping to keep submarginal lands out of other agricultural crops for which they are neither suited nor needed. The recently established naval-stores experiment station in the Osceola National Forest offers facilities not available elsewhere for research on the technology of naval-stores production in cooperation with the forest management research of the Forest Service.

(g) SOIL SURVEY

Appropriation Act, 1938.....	\$301,208
Budget Estimate, 1939.....	328,700
Increase.....	<u>27,492</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase or decrease
Soil Survey:				
Soil survey.....	\$295,606	\$301,208	\$328,700	+ \$27,492 (1)
Unobligated balance.....	5,602	- - -	- - -	- - -
Total appropriation.....	301,208	301,208	328,700	+ 27,492

INCREASE

(1) The increase of \$27,492 in this item for 1939 consists of:

(a) An apparent decrease of \$2,500 due to the transfer of this amount to the Office of the Secretary for use in the development of an Office of Land Use Coordination.

(b) An increase of \$29,992 for the soil survey. Accurate soil information is essential to the rural land-use programs of the Department and the States. There is now, and has been, especially during the past five years, an unprecedented demand for soil surveys. With the assistance of several Federal agencies, local and State governments are striving toward a better utilization of their lands. This extensive program of adjustment of rural land-use has placed a very heavy burden on the Soil Survey for the interpretation of existing soil maps and for the construction of new soil maps in critical areas. Present funds do not allow full cooperation with the States desiring to cooperate. Many States are willing and anxious to cooperate financially in making these surveys but require the assistance of technically trained personnel and the background and experience of the Federal Soil Survey for guidance. No other agency has the experience, organization, or personnel for performing this essential research. The increase recommended for 1939 will allow the Soil Survey to extend somewhat more cooperation to other interested agencies with a view to assuring accuracy of definition and nomenclature on cooperative surveys and accuracy of interpretation of soil maps for specific land-use programs.

WORK UNDER THIS APPROPRIATION

The object of the Soil Survey is to classify and map soils of the United States and to describe their characteristics, particularly in reference to the growth of various crops, grasses, and trees. The ultimate purpose is to provide accurate soil maps of the country necessary for the classification of rural lands and for the factual basis in the development of any rational program of land use, whether by public agencies or the individual farmer. The work comprises the determination of the character of soils, the definition of soil types, development of a uniform system of classification for the Nation, delineation upon maps of the boundaries of each type, the correlation of the various soil types in the country, and the interpretation of their relationship to the production of crops, grasses, and trees. This information is made available in published form to those interested in all phases of agriculture and other problems of land use. State cooperating agencies and other public organizations are furnished advance photographic copies of the field work for their immediate use when needed at once. Essentially all of the work is accomplished in financial cooperation with the various States and is necessary to them for the development of programs for the readjustment of their agriculture on a sound basis. For the past several years special reports and surveys have been made for various other Governmental agencies which have need for physical data regarding land in order to develop the programs which are under their responsibility.

A. A. A. FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Agricultural Adjustment Administration</u> (transferred to Bureau of Chemistry and Soils):		
1. <u>Payments for Agricultural Adjustment:</u>		
Soil surveys in Puerto Rico.....	\$6,683	\$43
2. <u>Salaries and Expenses:</u>		
Soil surveys in Hawaii.....	13,540	--
Total, A.A.A. Funds.....	20,223	43

(h) SOIL CHEMICAL AND PHYSICAL INVESTIGATIONS

Appropriation Act, 1938.....	\$78,081
Budget Estimate, 1939.....	<u>76,700</u>
Decrease.....	<u>1,381</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
<u>Soil Chemical and Physical</u> <u>Investigations:</u>				
(a) Chemical and physical analyses and tests of soils and soil mater- ials.....	\$14,000	\$14,000	\$13,700	- \$300 (1)
(b) Investigations of the chemical and physical properties of soils..	48,890	49,081	48,500	- 581 (1)
(c) Selenium investiga- tions.....	15,000	15,000	14,500	- 500 (1)
Unobligated balance.....	191	- - -	- - -	- - -
Total appropriation.....	78,081	78,081	76,700	- 1,381 (1)

DECREASE

(1) A decrease of \$1,381 is submitted in this item for 1939, distributed by projects as indicated in the foregoing table.

WORK UNDER THIS APPROPRIATION

Work under this appropriation includes research on the chemical and physical properties of soil, the influence of different components and their significance in soil classification and utilization, and other phases of soil science; study of the selenium content of soils and its relation to toxicity of vegetation grown thereon; and chemical and physical analyses and tests of soils and soil materials chiefly for the Soil Survey and other Government agencies.

Service work for the Government agencies consists of mechanical analyses and chemical determinations which are required for specific problems in soil survey, erosion control, plant industry, animal industry, buildings and grounds projects, and other problems relating to soils and soil materials.

Research work is at present largely centered on soil colloids - the active components of the soil - a thorough knowledge of which is essential to satisfactory classification of soils for land utilization and soil conservation; study of soil organic matter, including chemical research on peat, with a direct bearing on the utilization of 110,000,000 acres of domestic peat deposits; and investigations of soil moisture relationships. A special study is being made of the various quick chemical tests of soil needs and of their reliability for practical agriculture.

Selenium investigations are concerned with the determination of the extent and intensity of the selenium toxicity of soils, a condition which exists in more or less acute form in widely distributed areas in the Middle West and which results in the growth of toxic vegetation responsible for certain animal diseases in the sections affected.

(i) FERTILIZER INVESTIGATIONS

Appropriation Act, 1938.....	\$269,595
Budget Estimate, 1939.....	<u>263,800</u>
Decrease.....	<u>5,795</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
Fertilizer Investigations:				
(a) Mixed fertilizer investigations.....	\$59,200	\$59,200	\$57,000	- \$2,200 (1)
(b) Potash fertilizer investigations.....	28,979	31,000	31,000	- - -
(c) Phosphate fertilizer investigations.....	26,015	26,015	26,000	- 15 (1)
(d) Nitrogen fertilizer production investigations..	34,370	34,370	34,300	- 70 (1)
(e) Catalyst investigations..	32,440	32,440	30,000	- 2,440 (1)
(f) Biochemical nitrogen-fixation investigations	29,880	29,880	29,800	- 80 (1)
(g) Fundamental physical and chemical fertilizer investigations.....	56,690	56,690	55,700	- 990 (1)
Unobligated balance.....	2,021	- - -	- - -	- - -
Total appropriation.....	269,595	269,595	263,800	5,795 (1)

DECREASE

(1) A decrease of \$5,795 is submitted in this item for 1939, distributed by projects as indicated in the foregoing statement.

WORK UNDER THIS APPROPRIATION

Work under this appropriation consists of investigations on the chemistry, physics, technology, and production of the fertilizer ingredients--nitrogen, phosphoric acid, potash and soil amendments such as lime, sulphur, magnesium, and manganese. The work has for its purpose the development of methods for the utilization of our many natural resources and byproducts in order to give the farmers the greatest value for the money they invest in plant food. The farmers of the United States normally use from 7,000,000 to 8,000,000 tons of commercial fertilizer each year at a cost of approximately \$240,000,000. The research is directed toward the development of more efficient and economical processes for the manufacture of potassium nitrate, potassium sulphate, urea, etc.; production of new fertilizer compounds, such as calcined phosphate, organic phosphates, chlorophosphate, calcium metaphosphate, potassium metaphosphate, ammoniated peat, etc.; improvement in the quality of fertilizer materials and mixtures to give maximum beneficial effects to crops and soils, and improvements in their physical condition to facilitate handling and distribution in the field; increasing the plant food content of fertilizers and eliminating fillers to reduce handling, bagging, storage, and transportation costs; and utilization of new sources of raw materials, or low-grade materials formerly wasted, and of byproducts from the industries. The solution of these main problems also calls for the use of many fundamental chemical and physical data which can be obtained only by a comprehensive research program.

The development of suitable fertilizers and methods for their more effective use as plant foods is of vital importance in such national problems as soil erosion and flood control, the proper utilization of land, rehabilitation, and the conversion of a large acreage of unproductive land into grasslands and forests.

A. A. A. FUNDS
(Complete bureau statement)

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Agricultural Adjustment Administration</u> (transferred to Bureau of Chemistry and Soils):		
1. <u>Payments for Agricultural Adjustment:</u>		
Soil surveys in Puerto Rico.....	\$6,683	\$43
2. <u>Salaries and Expenses:</u>		
Soil surveys in Hawaii.....	13,540	--
Total, A. A. A. Funds.....	20,223	43

PASSENGER-CARRYING VEHICLES

The authorization for the purchase of passenger-carrying vehicles for the Bureau of Chemistry and Soils contemplates an increase of \$325 (\$1,575 in 1938, \$1,900 in 1939). This authorization will permit the replacement of four automobiles at an estimated net average cost of \$475 each, when exchange allowances are taken into account. These cars are required for the inspection and supervision of soil-survey field work throughout the United States.

This estimate is based on the assumption that it will not be necessary to purchase, during the current fiscal year, any of the three cars for which the Bureau now has authorization, but that it will be possible to defer their replacement until the fiscal year 1939. If it becomes uneconomical to continue to operate the older cars that long, they will be replaced in 1938, and there will, of course, be a corresponding reduction in the number of cars purchased in 1939.

The four cars to be replaced will be four years old at the beginning of the fiscal year 1939, and they will have traveled from 40 to 50 thousand miles by that time.

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

(a) GENERAL ADMINISTRATIVE EXPENSES

Appropriation Act, 1938.....\$166,280
 Budget Estimate, 1939 166,280

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
General administration and business service.....	\$162,100	\$166,280	\$166,280
Unobligated balance.....	180	- - -	- - -
Total appropriation.....	162,288	166,280	166,280

WORK UNDER THIS APPROPRIATION

The funds provided under this appropriation are used for general administrative purposes, including the determination of policies; general administrative supervision of all departmental and field activities; business operations; approval and preparation for publication of manuscripts concerned with the scientific, technical, and other activities of the Bureau; preparation and distribution of general information on control of insect pests; maintenance of a comprehensive library of entomological literature and the preparation of bibliographies on entomological subjects; and the handling of general information relating to Federal quarantines and preparation of cases on quarantine violations.

EMERGENCY FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act of 1935:</u>		
General administrative expenses.....	\$6,581	- - -
<u>Emergency Relief Appropriation Act of 1936:</u>		
General administrative expenses	47,452	11,548
<u>Emergency Relief Appropriation Act of 1937:</u>		
General administrative expenses.....	- - -	115,000
Total, Emergency Funds	54,033	126,548

These funds are used for administration of emergency work relief projects set forth under the various headings in the following notes and summarized at the end hereof.

(b) FRUIT INSECTS

Appropriation Act, 1938.....\$428,600
 Budget Estimate, 1939.....428,600

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Investigations on apple and pear insects.....	\$87,170	\$90,670	\$90,670
2. Investigations on peach insects	34,395	52,869	52,869
3. Investigations on grape insects	10,564	10,995	10,995
4. Investigations on nut insects	19,564	26,500	26,500
5. Investigations on insects attacking dried fruits.....	15,987	16,002	16,002
6. Investigations on citrus and other subtropical fruit insects.....	40,109	41,020	41,020
7. Investigations on fruit flies which are potential pests in continental United States.....	59,707	75,411	75,411
8. Investigations on the insecticidal value of oils...	4,622	5,120	5,120
9. Investigations on Japanese and Asiatic beetles.....	107,051	110,013	110,013
Unobligated balance.....	12,462	- - -	- - -
Total appropriation.....	391,631(a)	428,600	428,600

(a) For 1937, excludes \$7,900 allotted to "Foreign Parasites".

WORK UNDER THIS APPROPRIATION

General.-- This appropriation provides for investigations on insects affecting fruits, fruit trees, nuts, grapes, and those small fruits which have their seeds internally, such as blueberries and cranberries, and the development of measures for their control. The work also includes investigations on the Japanese and Asiatic beetles and fruit flies--such as the Mediterranean fruit fly and the Mexican fruit fly. The studies on insects other than fruit flies native to other countries are directed by the Division of Fruit Insect

Investigations which is headquartered in Washington. Field laboratories at which investigations are carried on and where growers may obtain information as to the control of pests are maintained in the principal fruit-growing regions of the country. The investigations on fruit flies native to other countries are directed by the Division of Fruit Fly Investigations with headquarters in Mexico City, Mexico. Field laboratories for these studies are maintained in Mexico, Hawaii, Puerto Rico, and the Canal Zone.

1. Investigations on Apple and Pear Insects.--The funds provided under this project are used almost exclusively for investigations to develop effective and economical means of controlling numerous pests of apples. The standard control for the codling moth leaves harmful insecticidal residues on the harvested fruit and presents such a critical situation and such a difficult problem that funds under this project have, during the past year, been devoted almost exclusively to investigations on the codling moth. The use of the standard insecticide, arsenate of lead, for the control of the codling moth leaves residues of lead and arsenic which may be injurious to human health. This condition is corrected in part by washing the fruit in dilute hydrochloric acid or other solvents to remove excessive residue. This operation is costly and cannot be economically applied throughout the entire country. Effective substitutes for the method of control now recommended are needed at as early a date as practicable. The investigations now under way include laboratory and field tests on new insecticides, control by traps and baits, and the use of cultural practices and natural enemies.

A small part of the funds under this project is used for incidental investigations on such pests as the woolly apple aphid, the tarnished plant bug, and the pear thrips. The losses caused by the pear thrips during the past few years have been especially heavy, and cooperative studies have been begun with the Oregon Agricultural Experiment Station.

2. Peach Insect Investigations.--Funds allotted to this project are used for investigations on the various insects attacking peaches, such as the Oriental fruit moth, plum curculio, San Jose scale, and the peach-tree borer, and for investigations to determine the relation of insects to peach diseases, particularly phony peach and peach mosaic.

In the absence of effective insecticidal control for the Oriental fruit moth, emphasis is being placed on the control of this pest by natural enemies. Certain native parasites have proven to be effective and these are being colonized in areas recently infested by the moth. In addition to colonization of native parasites, special attention is devoted to the importation and colonization of parasites from Japan. Several very promising parasites have been imported from the Orient and are being propagated at the laboratory at Moorestown, New Jersey, for liberation in infested areas. In some limited sections parasites have become sufficiently well established to bring about very appreciable control. Further work in this field should be of material benefit to other sections of the extensive area now infested by this pest.

Investigations on the plum curculio and peach-tree borer are being carried on at the laboratory in Fort Valley, Georgia. In the case of the

curculio, special attention is being directed toward the development of measures for control which will not require the use of lead arsenate throughout the season. When so used in areas where two broods of the curculio occur, objectionable residues may remain on the fruit after harvest, and no method for its removal is available. The recent studies on the peach-tree borer have directed special attention to test experiments to determine the effectiveness of a new method of treatment developed at the Fort Valley laboratory in certain other parts of the country. These tests have been carried on co-operatively with entomologists in several States, notably New York and Illinois. The residual effect of lime sulphur as an aid in control of the San Jose scale has been studied.

Certain diseases of peach, particularly phony peach and peach mosaic, may be carried by insects. Intensive studies to determine the relations which insects may have to the spread of these diseases are under way with increased funds provided for this purpose in the act providing appropriations for the current fiscal year.

3. Grape Insect Investigations.--The major problem being studied under this project is the development of effective means for controlling the grape berry moth without causing objectionable spray residues. Studies are under way to determine the practicability of modifying cultural practices so as to keep down heavy infestations, thus reducing the number of spray applications necessary. Investigations on insecticides other than those which leave objectionable spray residues are also under way. Many of those tested remove the "bloom" of the grape desired especially for table varieties. The impracticability of washing grapes increases the difficulty of solving this problem. Changes in materials used in sprays or in the spray schedule also effect the control of certain other pests, such as the grape root worm, the rose chafer, and the leaf roller, which have heretofore been held under control by sprays applied for the grape berry moth. Small amounts are used for studies on two of the more important of these.

4. Nut Insect Investigations.--This project provides for investigations on insects attacking nuts and the development of methods for their control. These investigations are concerned largely with insects attacking pecans, including such pests as the nut case bearer, shuckworm, pecan phylloxera, pecan black aphid, and an obscure scale. Effective controls for these pests are not available under all conditions existing throughout the area where pecans are produced. The controls applied in some sections are unsuitable in others. In some sections the use of oil sprays for the control of scale has caused considerable tree injury not experienced in other localities. The investigations on pecan insects are carried on at four field laboratories. The one at Albany, Ga., is concerned mostly with investigations on the shuckworm; and one at Brownwood, Tex., is studying certain case bearers and the black pecan aphid; the one at Shreveport, La., is giving special attention to the obscure scale, phylloxera and June beetles; the one at Monticello, Fla., which is cooperative with the State, is giving attention to the nut case bearer. During the current fiscal year studies have been begun in Oregon on insects attacking filberts, for which special funds were provided.

5. Dried Fruit Insect Investigations.--The work under this project is concerned with insects attacking dried fruits and the determination of methods for their control. Many of the insect pests found in dried fruit occur in and infest the fruit in the orchard as well as when it is being dried and stored. These activities are largely centered in the laboratory at Fresno, Calif., and many of them are carried on in cooperation with the University of California and the Dried Fruit Association of California.

6. Investigations on Citrus and Other Subtropical Fruit Insects.--This project is concerned with investigations on insects attacking citrus and other subtropical fruits and the development of measures for their control. These studies are carried on at field laboratories in Florida and California. In California particular attention is devoted to the development of effective methods of controlling the California red scale and citrus thrips. Methods for control of the red scale previously worked out have been found to be ineffective in certain sections where the insect seems to be resistant to the standard methods of control by fumigation. In this same general section the control of the citrus thrips by the use of sulphur is not fully effective. The method and time of application of various controls require further study. Work in California is carried on in cooperation with the California Citrus Experiment Station and coordinated with that done by other agencies.

In Florida special studies are being conducted in cooperation with the Bureau of Plant Industry and the Bureau of Chemistry and Soils on the effect of certain insecticides on citrus trees and fruits. The use of sulphur for the control of rust mites and certain scale insects is also being studied in Florida. Special emphasis is being placed on the timing of applications and the relation of the dosages, including determination of the period during which sulphur may remain on the foliage in sufficient amounts to be effective. Limited attention is also directed at the development of methods of control for papaya fly and white flies and scales which attack a number of kinds of subtropical fruit trees.

7. Investigations on Fruit Flies Which Are Potential Pests in Continental United States.--This project is concerned with investigations on the biology and methods of controlling certain important fruit flies in their native regions in order to provide information which will aid in preventing them from entering the United States, as well as the development of methods for their control if they should become established in the United States. The investigations are headquartered in Honolulu, T. H.; Mexico City, Mexico; Balboa, Canal Zone; and Mayaguez, Puerto Rico. The work in Hawaii is concerned with the Mediterranean fruit fly and the melon fly. Special attention is now being directed to the development of bait sprays to be used in controlling the adults, development of attractants that may be used in traps, and determination of more effective methods for the disposal of waste or cull fruit. Additional tests to determine the time interval when certain high and low temperatures are fatal to the fruit fly are also under way. In Mexico City special attention is directed to the Mexican fruit fly and certain related species. Particular attention is now being given to developing attractants that can be used in traps to detect the presence of the

fly, and sprays to aid in its control. Such information is particularly needed in connection with the work in the Lower Rio Grande Valley in Texas. The work in the Canal Zone is concerned with studies on the life history, habits, and hosts of numerous species of fruit flies which occur there and which are a menace to the fruit cultures of the United States. In Puerto Rico experiments are under way to determine more effective methods of combating the two kinds of fruit flies which occur there and previously referred to as the West Indian fruit fly, particular attention being directed to methods of treating fruit to kill any living forms it may contain.

8. Investigations of the Insecticidal Value of Oils.---This project provides for investigations to develop oil sprays for the control of insect pests on fruit trees. Basic information is needed to determine the kinds of oils that may be safely used for this purpose. Attention is now directed to the use of oil sprays to which other toxic substances have been added to kill citrus red scale and the use of such materials to supplement fumigants now used to combat this pest. These studies are conducted at the laboratory at Whittier, California.

9. Investigations on Japanese and Asiatic Beetles.---This project provides for investigations to determine methods of control for three introduced pests of major importance--the Japanese beetle, Asiatic garden beetle, and Oriental beetle. The work under way is concerned with the development of more effective methods of control of these pests by the use of insecticides and by other artificial means, the introduction and colonization of parasites which may aid in reducing their numbers, and the determination of methods of treating plants or plant products which may carry this pest into uninfested regions. These investigations include work on the adults and larvae, as these beetles are injurious as grubs and adults. These activities are headquartered at the laboratory at Moorestown, New Jersey, but sublaboratories are maintained in certain outlying sections for the study of the insect in areas where it is becoming established.

AGRICULTURAL ADJUSTMENT ADMINISTRATION ALLOTMENT

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Agricultural Adjustment Administration</u> (Payments for Agricultural Adjustment):		
Fruit fly control in Hawaii (in lieu of sugar tax funds).....	\$19,500	\$5,000

(c) JAPANESE BEETLE CONTROL

Appropriation Act, 1938.....\$425,000
 Budget Estimate, 1939.....395,000
 Decrease.....30,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
• Japanese beetle control operations:				
(a) Supervision of nurseries and greenhouses for Japanese beetle control.....	\$169,069	\$170,000	\$162,900	-\$7,100 (1)
(b) Scouting adjacent to nurseries and greenhouses for Japanese beetle control.....	19,445	29,600	29,600	---
(c) Trapping to determine distribution of the Japanese beetle.....	85,867	96,000	88,000	-8,000 (1)
(d) Soil treatment and trapping in isolated areas to aid in preventing spread of the Japanese beetle.....	15,845	23,900	9,000	-14,900 (1)
(e) Farm products inspection for Japanese beetle control.....	25,646	36,000	36,000	---
(f) Vehicular inspection for Japanese beetle control.....	22,245	51,000	51,000	---
(g) Transit inspection for Japanese beetle control.....	3,500	7,000	7,000	---
(h) Tests of treatment required for Japanese beetle control.....	6,422	11,500	11,500	---
Unobligated balance.....	1,961	---	---	---
Total appropriation.....	350,000	425,000	395,000	-30,000 (1)

DECREASE

(1) The Budget estimate contemplates a decrease of \$30,000 in this item for 1939 which will involve curtailment of the activities above indicated.

WORK UNDER THIS APPROPRIATION

This appropriation provides for control and prevention of spread of the Japanese beetle, including the determination of spread, the enforcement of quarantine regulations to prevent and retard spread into new localities, and inspection and certification of nursery stock and other materials the movement of which is regulated under Federal and State quarantines. In cooperation with the State and local agencies, control measures are conducted to suppress the beetle at points considerable distances from the generally infested area to prevent developing new centers of spread. The work involves a number of activities which are briefly described as follows:

The Japanese beetle occurs in the largest nursery sections of the United States. Nursery products produced in the infested area are shipped to every State in the United States. To prevent them from carrying the beetle to uninfested sections all those moving from the quarantined area must be handled or treated in a manner to eliminate risk of spreading of infestation. Products produced or handled as required by quarantine regulations and after prescribed inspection are certified and may move freely and without risk of carrying the pest into new sections. The requirements provided as a basis of certification vary with the class of nursery stock and the degree of infestation in or adjacent to the nursery or greenhouse in which it is produced. The adequate enforcement of these requirements forms the sole protection against the distribution of the Japanese beetle by these materials. Nursery stock is one agent by which the beetle may easily be transported into new sections. It is believed that this pest entered the United States in soil around the roots of nursery stock. If our uninfested regions are to be protected from infestation, it is important that adequate provision be made for inspection and certification of similar material moving to points outside the quarantined area. There are more than 1,600 nurseries in the regulated area and hundreds of thousands of plants are offered for shipment annually.

Nurseries and greenhouses in the quarantined area are classified on the basis of presence or absence of beetles on or adjacent to the individual premises. The requirements for certification of the two classes of establishments differ. A very essential part of the enforcement of quarantines for the protection of uninfested regions is the classification of these establishments, which can be determined only by scouting rather than by the use of traps. Inspection work of this type must be done with great care to avoid erroneous classification of establishments so as to not work undue hardship on the producer and at the same time give adequate safeguards against products that may move from their establishments.

It is essential to the effort to retard the spread of the Japanese beetle that we have accurate information as to the possible presence of outlying infestations. To secure this information traps are operated to determine the possible presence and relative abundance of the beetle. The traps are operated in selected localities where infestation is light and at places outside the known infested area, particularly along main highways or at important railroad centers. The prompt location of

incipient outlying infestations can be accomplished only by this type of work, and any curtailment will, as in the case of St. Louis, Mo., delay location of centers of infestation for a number of seasons. Trapping operations begin in the Southern States early in June and at later dates in the more northern sections.

The operation of a large number of traps to aid in the reduction of beetles is an important part of control operations carried on at certain isolated centers of infestation. St. Louis, Mo., and Erie, Pa., are examples where trapping for control is carried on. In outlying areas where it is practical to locate sections where there is good reason to believe grubs occur in the soil, the application of certain treatments, such as arsenate of lead, will materially aid in reducing the number of beetles that appear next season. Work of this type is carried on in cooperation with the State or local agencies.

Many types of farm products, particularly fruits and vegetables, may carry adults of the Japanese beetle into uninfested regions. Beans, apples, peaches, and berries are produced in considerable quantities in the infested area and are products which must be handled under proper safeguard before they are shipped into the uninfested regions. The type of handling required prior to certification of various classes of products varies with the nature of the product. Various types of berries are fumigated and peaches are inspected, while beans are run through a mechanical device to shake off the beetles. Provision is also made that products inspected and certified be subsequently handled in a manner to prevent reinfestation. Products of this type are perishable, and the force of inspectors must be adequate to supervise the required treatment or inspect them promptly and effectively, so they can move in as nearly a normal manner as possible and still eliminate the risk of spreading the beetle.

To assure that products likely to carry the beetle are being moved only in accordance with the requirements of the quarantine, road stations are maintained on various highways leading from the quarantined area.

Inspectors are stationed at certain important transportation centers within the infested area during part of the season to examine products regulated by the quarantine in order to assure that common carriers comply with the regulations of the Japanese beetle quarantine regarding the movement of products that may carry this pest.

It is necessary to know that the methods of treatment devised under certain limited conditions are effective when applied commercially under different conditions. To determine the fitness or inadequacy of various treatments authorized as a basis of certifying products regulated under quarantine it is necessary to make repeated tests. Without this repeated checking, possible weaknesses under prevailing conditions might not be detected and thus shipment of living beetles in certified articles might be unknowingly permitted.

(d) MEXICAN FRUIT FLY CONTROL

Appropriation Act, 1938.....\$160,460
 Budget Estimate, 1939 160,460

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Mexican fruit fly control operations:			
(a) Grove and packing-house inspection and certification for Mexican fruit-fly control.....	\$109,527	\$128,660	\$128,660
(b) Spraying and control of Mexican fruit fly in Texas.....	16,341	21,800	21,800
(c) Spraying and control of Mexican fruit fly in Mexico.....	5,000	5,000	5,000
(d) Vehicular inspection for Mexican fruit-fly control.....	5,000	5,000	5,000
Unobligated balance.....	4,592	---	---
<u>Total appropriation.....</u>	<u>140,460</u>	<u>160,460</u>	<u>160,460</u>

WORK UNDER THIS APPROPRIATION

This appropriation provides for control and regulatory operation directed against the Mexican fruit fly to protect the fruit-growing areas in the United States from danger of infestation by this insect, which is known to attack many different kinds of fruits. These include the enforcement of the domestic quarantine on account of this pest, the supervision of control operations in the quarantined area in the Lower Rio Grande Valley of Texas, and cooperation with the Mexican Government and local Mexican authorities to suppress the infestation of this pest as much as possible in areas in Mexico adjacent to the regulated area of Texas to reduce danger of reinfestation from that source.

The work carried out under this item involves a number of different activities which are briefly discussed in the following paragraphs:

The Federal domestic quarantine on account of the Mexican fruit fly requires that the growers, packing plants, and shippers comply with certain practices before fruit will be certified for moving to points outside the regulated area. The compliance with these practices reduces or eliminates the opportunity of spread of the pest through the movement of fruit, thus giving protection to the uninfested sections. The

certification of fruit moved from the area assures compliance with the quarantine requirements and permits the movement of fruit from regulated areas to markets throughout the United States. The quarantine provides for the maintenance during the summer of a non-host period when fruits which may be attacked by the fruit fly do not remain on the trees. It provides for the removal and destruction by approved practices of culls and dropped fruits, for the maintaining of sanitary requirements in packing houses and similar places where fruit is handled, for the disposal by approved practices of fruit from areas where infestation may be detected, and for the sterilization of fruit when this is required as a condition of movement. Citrus is the only fruit commercially produced in the regulated area. There are more than 6,000,000 trees set out in grove formation that have already reached the bearing age. The inspection of these trees to locate possible presence of the fruit fly and inspections to see that the growers and packing houses are maintained to comply with the quarantine regulations require a large amount of labor. To handle the work of inspection and certification of products in the regulated area more effectively, the area is divided into 12 districts.

To detect the possible presence of the fruit fly traps are operated a considerable portion of the year. If adult flies are found, a poison spray on which the adults feed may be applied in the groves so the adults will be killed prior to the laying of eggs. To be fully effective the proper application of this spray is essential and the work must be closely supervised.

No commercial fruit is produced in Mexico adjacent to the Lower Rio Grande Valley in Texas where infestations of Mexican fruit fly have been found. The only fruit trees in adjacent Mexican territory are those in dooryards grown largely for shade or ornamental purposes. Considerable quantities of fruit, however, are shipped from the interior of Mexico into this area for local consumption. Much of this fruit is infested and is a source of infestation of the fruit produced on dooryard and ornamental trees. The presence of this fruit and infestation permits the development of adult flies which may fly across the Rio Grande and infest the fruit grown in the regulated area in Texas. To reduce this opportunity inspection and clean-up work are carried on in Matamoros and other Mexican towns adjacent to the regulated area. These operations may involve the disposition of infested fruits and the application of a poison spray to dooryard and fruit trees. This work is carried on with the hearty cooperation of the Mexican officials and citizens residing in that area.

Two highways leave the area in Texas regulated on account of the Mexican fruit fly. Large quantities of fruit are moved over these highways by truck and similar vehicles. To assure that the fruit so moving has been certified as meeting the requirements of the quarantine, road stations are maintained at appropriate locations.

(e) CITRUS-CANKER ERADICATION

Appropriation Act, 1938.....\$13,485
 Budget Estimate, 1939..... 13,485

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Citrus-Canker Eradication ...	\$13,438	\$13,485	\$13,485
Unobligated balance.....	47	---	---
Total appropriation.....	13,485	13,485	13,485

WORK UNDER THIS APPROPRIATION

This appropriation provides for the eradication of the bacterial disease of citrus known as citrus canker. These activities are carried on in active cooperation with the responsible agencies of the States concerned and the growers in localities where the disease occurs. Through intensive inspection of nurseries and citrus groves an effort is made to locate and destroy all trees infected with this dreaded disease. As a result of the vigorous campaign which has been carried on against this disease in the past, it is practically eliminated from the important commercial citrus areas. However, some isolated infections occur sporadically. The States that were infected are maintaining a close inspection of all citrus properties, and this should be continued. The infections have not been eliminated in Louisiana and Texas, although no infection is known to occur in commercial properties in these States. Infections have been found in noncommercial trees in four counties in Texas and in isolated areas in southern Louisiana.

The work of eradicating this disease has been intensified by allotments from Emergency Relief funds, and an effort is being made to eliminate the source of all infections. Intensive inspections have been made in Mississippi, Alabama, and west Florida which were previously infected but no infection has been discovered. The locating and destruction of diseased trees in jungle areas where citrus trees occur as voluntary or escape stands of no importance and the elimination of seedlings from areas where infected trees have been removed are important features of the present work. Plants of this type may harbor the disease and prevent the completion of the eradication effort. Because of the extreme infectiousness of this disease, scattered infections may also occur in dooryard plantings outside commercial districts. It is necessary to follow up the work done in infected commercial properties and reinspect areas in noncommercial sections, even where trees have been removed, to see that all the shoots or sprouts have been eliminated or are free from infection. The presence of outside centers of infection

are a menace to citrus cultures, and continued inspection and eradication work are essential until the disease has been completely eliminated.

EMERGENCY FUNDS

Projects	Obligated 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act of 1935:</u> Citrus-canker eradication.....	\$12,187	---
<u>Emergency Relief Appropriation Act of 1936:</u> Citrus-canker eradication.....	174,300	---
<u>Emergency Relief Appropriation Act of 1937:</u> Citrus-canker eradication.....	---	\$29,934
Total, Emergency Funds	186,487	29,934

(f) SWEET POTATO WEEVIL CONTROL

Appropriation Act, 1938.....\$75,000
 Budget Estimate, 1939.....75,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Sweet potato weevil control.....	- - -	\$75,000	\$75,000

CHANGE IN LANGUAGE

The phrase "to be immediately available" be eliminated from this paragraph in the Budget estimates. When the estimate of funds required for sweet potato weevil control was submitted last year it was anticipated that the control work against this pest would be begun during the latter part of the fiscal year 1937. The Act providing the appropriation was not approved until June 29, 1937, and the control work against this pest began at the beginning of the fiscal year and is being carried out on that basis.

WORK UNDER THIS APPROPRIATION

This appropriation provides cooperation with States in the control and eradication of the sweetpotato weevil. The sweetpotato weevil is an introduced insect which is a limiting factor in the production of sweetpotatoes in the area where the pest occurs. The grub feeds within the vines and tuber of the sweetpotato. It so injures the tuber that it is of little or no value for commercial purposes. The presence of grubs within the vine may cause the destruction of the plant or retardation of its growth. Besides feeding on sweetpotatoes the weevil also feeds on a variety of plants related to the sweetpotato, such as wild morning glories. In localities where such wild hosts persist in a growing stage throughout the year, eradication of the weevil is not practicable, however, production of sweetpotatoes is of no commercial importance in these sections. The work is conducted in cooperation with States and includes intensive inspections to locate infestations in the commercial sweetpotato producing areas; enforcement of quarantine measures to prevent the spread of the pest to uninfested areas and reinfestation of localities from which the pest has been eradicated; application of eradication measures such as the destruction of host plants, clean-up operations in fields, storages, and the use of sweetpotato seed free from weevil infestation; and the development of methods for fumigating or treating sweetpotatoes to eliminate reinfestation by this means. An important feature consists of educational and demonstrational activities to advise growers on methods of combating the pest, particularly as to the methods which will enable them to carry out work they should do on their own properties.

These activities may be divided into the four groups briefly discussed in the following paragraphs:

Inspections to determine the extent of infestation are carried on during the summer months in sweetpotato seed beds and where the volunteer plants were growing in fields in which potatoes were planted the previous year. In the fall, the inspections are concentrated in areas where potatoes are held in storage plants. Inspections in the spring are made largely in areas where sweetpotatoes are produced for bedding purposes.

In localities where infestations have been located in the commercial sweetpotato producing area effort is made to eradicate these infestations by the adoption of sanitary practices, including the clean-up of crop remnants, destruction of seed beds after the plants have been removed, and clean-up in and around storage beds, houses, and similar places where sweetpotatoes are stored. These activities are carried on under State authority, and inspectors, State and Federal, supervise and direct the operations. Labor required in carrying out the work is provided by local agencies, including growers in the area where the work is done.

Information is not available as to the fumigants or other treatments that can be used to eliminate infestation in tubers stored for home consumption or commercial use in areas where infestation occurs. Tests are made with various fumigants to determine the dosage, and time and temperature requirements to kill the weevils in different stages of maturity without injuring the sweetpotatoes for the purpose for which they are intended.

Cooperating States have promulgated necessary quarantines and regulatory orders to prevent the spread of the weevil into noninfested areas and to prevent the reinfestation of localities in which the weevil is being controlled or has been eradicated. The individuals employed under this appropriation are designated by authorized State agencies to act as State inspectors in the enforcement of regulatory measures and cooperate with State inspectors in such work.

(g) PHONY PEACH AND PEACH MOSAIC ERADICATION

Appropriation Act, 1938.....\$89,800
 Budget Estimate, 1939.....89,800

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Eradication of phony peach and peach mosaic.....	\$49,790	\$89,800	\$89,800
Unobligated balance.....	38	- - -	- - -
Total appropriation.....	49,828	89,800	89,800

WORK UNDER THIS APPROPRIATION

This appropriation provides for the control and eradication of two important virus diseases of peach. One of these diseases is known as phony peach and is a serious infectious disease which makes peach orchards unprofitable by reducing both the size and quality of the crop. The other, peach mosaic, is a disease which has only recently appeared in parts of the United States. It injures the tree by causing it to become stunted and produce undersized fruit which is hard, irregular in shape, and of reduced commercial value. The only method of combating these diseases is to remove and destroy the tree. These operations are carried on in cooperation with State agencies. The appropriation also provides for cooperation with State authorities in the certification of products of the infested areas to meet the requirements of State quarantines.

The accurate determination of trees infected with phony peach disease or with the peach mosaic disease requires special training. One of the important phases of eradication work carried on under this item in cooperation with the States includes inspections to locate diseased trees. These operations are conducted by trained inspectors employed under this project. The removal of diseased trees is carried on under the authority of the cooperating States and with funds or means supplied by them or from emergency funds

allotted to the Bureau for this purpose. To prevent long-distance spread through the shipment of nursery stock containing diseased trees, intensive inspections are made in and around nurseries that produce peach nursery stock. The shipment of nursery stock from areas in which the disease occurs is prohibited by State quarantines unless it is produced on premises in which no disease occurs within a radius of one mile in the case of phony peach and five miles in the case of peach mosaic. Inspectors employed under this item cooperate with the State agents by giving them assistance which will aid them in certifying products in compliance with State quarantines.

The phony peach disease has been found in the States of Alabama, Florida, Georgia, Arkansas, Illinois, Oklahoma, Louisiana, Mississippi, Missouri, North Carolina, South Carolina, Tennessee, and Texas. A few trees which have been affected with the disease have also been located in Maryland, Indiana, Kentucky, and Pennsylvania. The infection in most of the States is scattering with the exception of that which occurs in the main peach producing areas of Georgia, Alabama, Tennessee, and South Carolina. The disease was first located in Georgia. The peach mosaic disease has been found in Colorado, Utah, California, New Mexico, Arizona, Texas, and Oklahoma. Recently trees which may be infected with this disease have been located in Missouri and Indiana.

Emergency funds for relief purposes have been allotted to the Bureau to carry on work against both of these diseases. Prior to the current fiscal year all of the work to combat peach mosaic was done with funds from this source. The regular funds are required for technical and supervisory features. The work conducted with emergency funds has made it possible to make very substantial progress in the elimination of diseased trees. On certain areas, particularly sections where the phony peach occurs, large numbers of abandoned trees and seedlings which may harbor the disease have also been destroyed.

EMERGENCY FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act, 1935:</u>		
Control of phony peach disease.....	\$41,176	- - -
Control of peach mosaic disease.....	15,924	- - -
Total.....	57,100	- - -
<u>Emergency Relief Appropriation Act, 1936:</u>		
Control of phony peach disease	472,333	- - -
Control of peach mosaic disease.....	119,834	- - -
Total.....	592,167	- - -
<u>Emergency Relief Appropriation Act, 1937:</u>		
Control of phony peach disease.....	- - -	\$75,290
Control of peach mosaic disease.....	- - -	145,833
Total.....	- - -	221,113
Total, Emergency Funds	649,237	221,113

(h) FOREST INSECTS

Appropriation Act, 1938....\$253,100
 Budget Estimate, 1939.....253,100

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Investigations on forest insects:			
Investigations on the habits and the development of control methods for bark beetles attacking forest and shade trees.....	\$28,286	\$48,400	\$48,400
Investigations on the habits and the development of control methods for insects which feed on foliage of forest and shade trees.....	13,954	15,000	15,000
Investigations on the habits and the development of control methods for insects which bore through the wood and bark of forest and shade trees	5,000	5,000	5,000
Investigations on the habits and the development of control methods for sucking insects which attack forest and shade trees.....	1,000	1,500	1,500
Investigations on the habits and the development of control methods for insects attacking forest trees in nurseries, plantations, and areas of natural reproduction.....	500	6,000	6,000
Studies on the relation of climatic factors, such as heat, cold, moisture, etc., on forest insect populations.....	3,000	3,000	3,000
Investigations on insecticides for the control of insects attacking forest and shade trees.....	13,242	15,300	15,300
Investigations on the injection of chemicals into the sapstream of the tree for the control of bark beetle infestations and for the treatment of green trees to prevent insect attack upon the utilized wood.....	1,500	5,700	5,700

Projects	1937	1938 (Estimated)	1939 (Estimated)
Investigations on the habits and the development of methods for control of insects affecting forest products.....	\$ 2,000	\$ 4,000	\$ 4,000
Investigations on the habits and the development of methods for control of termites.....	2,000	10,000	10,000
Investigations on the value and use of introduced and native parasitic and predacious enemies upon introduced and native forest insects.....	8,800	8,800	8,800
Importation of natural enemies of forest and shade tree insects...	2,400	2,400	2,400
Surveys to locate and determine the status of insect pests of the forests and the giving of advice to land-managing agencies on planning and conducting necessary control work.....	44,233	74,210	74,210
Investigations to determine the relations of insects to the Dutch elm disease.....	26,987	24,400	24,400
Investigations on the relation of insects to azalea flower blight.	400	400	400
Dissemination of information to the public on methods of controlling forest and shade tree insects, including general inquiries on this subject.....	17,945	28,990	28,990
Unobligated balance.....	578	- -	- -
Total appropriation.....	171,825(a)	253,100	253,100

(a) For 1937 includes \$2,700 transferred from "Dutch Elm Disease Eradication" and excludes \$4,500 transferred to "Foreign Parasites".

CHANGE IN LANGUAGE

The phrase "of which \$400 shall be immediately available" is eliminated in the Budget estimates. Investigations on insects and their relation to azalea flower blight which are provided for under this item have to be carried on during the period when the flowers are in bloom, usually March or April. When the appropriation for these investigations was initially provided it was made immediately available so that investigations could be begun that season. However, this provision is now no longer necessary.

WORK UNDER THIS APPROPRIATION

This appropriation provides for investigations on insects injurious to forest and shade trees and forest products and for the determination of methods for controlling these pests. It provides for giving advice to land managing agencies on methods of controlling insect pests in forests and for surveys to develop facts regarding infestations and the areas where the control operations should be carried on. It also provides for cooperation with the land managing agencies in planning and directing campaigns to control outbreaks of insects which may affect large forested areas.

The activities are directed by the Division of Forest Insect Investigations from headquarters in Washington. The investigations and surveys are conducted from laboratories located in appropriate localities in the field and usually in the same towns as the experiment stations maintained by the Forest Service. The present field laboratories are located at New Haven, Conn., Morristown, N. J., Asheville, N. C., New Orleans, La., Fort Collins, Colo., Berkeley, Calif., Portland, Oregon and Coeur d'Alene, Idaho. The activities are divided into a number of work projects which are briefly discussed in the following paragraphs:

There are nearly 400 different kinds of bark beetles which attack forest and shade trees. Many of these are important pests, particularly those belonging to the genus Dendroctonus, which cause extensive destruction in coniferous forests. Bark beetles occur in all parts of the United States. Those which are major pests of coniferous trees occur in all sections. The distribution of the various species is, however, restricted by various factors. Certain of the important species feed on a number of different kinds of pines, and in some localities a number of kinds attack the same kind of trees. The various species differ in habits, and the method of control and the season when the work can be done depends not only on the kind of bark beetle but also on locality and the species of tree attacked. Control measures now recommended for important tree-killing bark beetles consist very largely of felling the trees and removal or destruction of the bark. These operations are costly and cannot be carried out economically except in connection with logging operations. Further studies on the habits and development of the beetles and experiments to test other methods of control should lead to the development of control measures which can be applied more economically. Some promising suggestions have been obtained. These include the use of penetrating oils which can be sprayed on the tree and the use of chemicals that will penetrate the bark. Investigations on the bark beetles are conducted at practically all the laboratories but receive special attention at those located in California, Colorado, Oregon, and Idaho.

There are many different kinds of insects which feed on the foliage of forest and shade trees. By far the greater number of these are native to the United States. Some of the important pests, such as the gypsy moth, the brown-tail moth, the willow beetle, etc., have been introduced from foreign countries. The methods of combating these insects on forest and shade trees depends upon the kind of insect and on the kind of tree attacked. The cost of the application of control measures, particularly that applied

for the protection of forest trees, is an important, and often limiting, factor in protecting trees from leaf-feeding insects. The investigations to develop more economic and effective methods of combating various species which feed on the foliage are carried on at many of the laboratories. Particular attention is being directed to the development of methods of control of the canker worm, various tent caterpillars, the bud worms, and leaf miners.

Many kinds of native insects, especially the larvae of beetles, bore into the wood and bark of forest and shade trees. The habits of the various kinds differ greatly. Some attack the trees only in a weakened condition. Others attack healthy trees. There is close association between insects of this type and those which destroy the foliage or suck the sap. In developing methods for the control of insects attacking forest and shade trees it is necessary to have information regarding the habits of boring insects which may be associated with primary species in order to give appropriate advice regarding control. Studies to secure needed information on these problems are carried on at most of the field laboratories.

Forest and shade trees are attacked by many different kinds of insects which feed on the juices of the plant. These forms include many species of aphids, scale insects, and various other sucking bugs. Certain of these like the beech scale and minute scales which occur at the base of the leaves of pines are intimately associated with plant diseases which attack the trees. Little information is available as to the exact relation between those sucking insects and the disease, and limited studies are under way to obtain more information regarding the insect, its relation to the disease, and to develop methods for control. Scale insects and aphids are common pests of shade and ornamental trees, often causing material damage in cases where the infestation caused the tree to die. Experiments to determine controls for some of these species are conducted at certain laboratories, particularly the one at New Haven, Connecticut.

Forest and shade trees in nurseries and in plantations and areas of natural reproduction are attacked by many kinds of insects, native and introduced. The introduced species include the European pine shoot moth and the European pine sawfly, which are important pests to nurseries and plantations in New England and adjacent areas. With the development in conservation, which includes much reforestation, the control of insects in nurseries and plantations has become a problem of increasing importance. Such native insects as the white-pine weevil, various kinds of white grubs and certain bud worms are limiting factors in the production of satisfactory nursery stock and the production of suitable trees in plantations in areas of natural reproduction. Limited investigations are being carried on to develop more information regarding the methods of combating certain of these pests and to develop economical methods for their control.

Abnormal weather conditions, such as unusual low temperatures and drought, affect the abundance of many different kinds of insects attacking forest trees. Limited studies are being carried on at several western stations to determine the relation of climatic factors of outbreaks of

various insects, particularly those caused by tree-killing bark beetles. Basic information of this type should have an important bearing on control operations. It has been determined that one of the destructive bark beetles is killed at certain low temperatures. This fact enabled the Bureau to revise, following the prolonged cool weather of last winter, the recommendation made to certain land managing agencies regarding the need for control operations in one area and resulted in saving approximately \$300,000 which would otherwise have been expended for control.

The most effective way of combating certain kinds of insects that attack forest, shade, and ornamental trees is with the application of insecticides. The use of insecticides is particularly applicable in combating insects attacking trees used for shade and ornamental purposes as such materials cannot usually be applied over large forested areas. Studies are now under way to determine the dosage and material most effective in controlling various kinds of insects attacking trees used for shade and ornamental purposes, and limited studies are under way to develop new types of insecticides which can be economically applied to large forested areas by the use of either ground machines or various kinds of aircraft.

Small quantities of certain chemicals are known to be toxic in the immature stages of various kinds of insects which feed on the bark and wood of trees. These materials can be injected into the sapstream of the tree and thus carried throughout the tree. Experiments to determine the type of material which can be most effectively and economically used to kill bark beetles by injecting chemicals into the sapstream of the tree are being carried on at Asheville, North Carolina, and also at some field stations in the West. The results obtained in connection with these experiments lead to the development and use of this method of control of the bark beetle which carries the Dutch elm disease from tree to tree. Further studies on this problem should make it possible to apply this method to other species and in other localities.

The crude forest products are attacked by a wide variety of insects, particularly various kinds of borers. Finished forest products are also subject to attack by boring insects, particularly forms commonly referred to as powder post beetles. Studies are under way to determine methods of preventing various insects from attacking forest products and to develop methods for their control.

Termites cause annual losses of many millions of dollars and are attracting unusual attention because of the increased expansion of building operations adjacent to the larger communities. Many materials are being used by various agencies for killing termites and various new methods are being advocated by certain commercial agencies. To determine the value of these and develop possible new methods for control, additional emphasis has been placed on investigations on termites. This work is being carried on in New Orleans, La., Asheville, N. C., Beltsville, Md., and in the Canal Zone.

Parasites and other natural enemies of forest insects contribute materially to the control of injurious species. Many different kinds of

parasitic and predacious insects have been introduced to aid in combating insects attacking forest trees, particularly the gypsy moth, brown-tail moth, satin moth, and the European pine shoot moth. Studies to determine the value of these natural enemies in combating these introduced insects are being carried on at the laboratory at New Haven, Connecticut. This laboratory is also engaged in recolonizing various introduced and native parasites and predators which offer promise as aids in controlling injurious species.

Explorations to locate parasites of introduced insects that attack forest and shade trees are being carried on in Europe, and the species which may aid in control are imported. Special attention is now being directed to importation of parasites of the larch case-bearer, the fir bark louse, and the European spruce sawfly.

Land managing agencies, such as the Forest Service, National Park Service, and the Bureau of Indian Affairs, as well as the private timber owners, look to the Bureau of Entomology and Plant Quarantine for advice on methods of controlling insect pests in forests and for planning the necessary control work. To give such advice it is necessary to conduct surveys to determine the status of insect pests in the forests, locate areas of infestation, and secure other information needed in planning control campaigns. The forests of the United States are extensive. To make it possible to secure information as to the status of insects from as much of the area as all available facilities will permit, forest rangers and others engaged in similar tasks are informed on various important pests and aid in assembling information regarding the status of these pests in forest areas where they are located. Reports received from these sources are preliminary in character, and before recommendations for control can be made it is necessary to make intensive surveys which can be used as a basis of plans for control operations. The surveys as carried on in the various regions are directed from the field laboratories where close contact and cooperation is maintained with the Forest Service, National Park Service, Bureau of Indian Affairs, and various private timber owners.

The Dutch elm disease is transmitted from tree to tree by certain bark beetles. Studies are under way to determine more information regarding those insects known to transmit the disease and to determine whether others may also serve as carriers. In carrying out the eradication work it is necessary to have definite information regarding the habits of the various insect vectors in order that these may be controlled and thus aid in reducing the spread of the disease. An important feature of the work is to obtain information regarding the flight range of the various insect carriers of the disease in order to determine their distribution and the effectiveness of various methods to reduce their numbers.

Azaleas in limited parts of the Southeastern States, particularly in the vicinity of Charleston, South Carolina, are destroyed by a blight which affects the bloom. This blight is caused by a disease and apparently

it may be transmitted from plant to plant or flower to flower by various insects. Investigations are under way to determine the relation of insects to the transmission of this disease. These are carried on in cooperation with the Bureau of Plant Industry.

Many inquiries are directed to the Washington and field offices regarding methods of controlling insects attacking forest and shade trees. The preparation of replies to these various inquiries is a part of the duties of all the field laboratories and an important part of the work of the Washington office requiring the time of employees stationed here.

EMERGENCY FUNDS

Indirect Allotment

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Conservation Work</u> (authorized by Act of March 31, 1933; allotment through War Department):		
Control of insect enemies of forests.....	\$61,919	- - -
<u>Emergency Conservation Work</u> (authorized by Act of June 28, 1937; financed through War Department):		
Control of insect enemies of forests.....	- - -	\$58,200
Total, Emergency Funds (Indirect Allotments).....	61,919	58,200

(i) GYPSY AND BROWN-TAIL MOTH CONTROL

Appropriation Act, 1938.....	\$400,000
Budget Estimate, 1939.....	<u>400,000</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Inspection and certification for gypsy and brown-tail moth control.....	\$99,201	\$99,282	\$99,282
2. Control operations for gypsy and brown-tail moth control.....	298,929	300,718	300,718
Unobligated balance.....	1,870	---	---
Total appropriation.....	400,000	400,000	400,000

WORK UNDER THIS APPROPRIATION

General.--This item provides for control work on the gypsy and brown-tail moths and for the inspection and certification of products to meet the requirements of the Federal quarantines for these insects. The work is divided into two projects as follows:

1. Inspection and Certification for Gypsy and Brown-Tail Moth Control.--

The work under this project deals with the inspection and certification of products originating in the quarantined area designated for shipment to points outside. The possibility of the distribution of the gypsy moth over long distances on shipments of products which might carry it is illustrated by records on such shipments. Infestations have actually been discovered on and removed from shipments destined to practically every State in the Union. This inspection and certification covers commodities which are grouped into nursery, quarry, forest, and evergreen products. The certification is based on inspection, and the commodities thus inspected and certified are eligible for interstate transportation. Industries located within the infested area which deal with articles likely to carry these insects are enabled under Federal certification to ship their products in the normal way. If there were no Federal quarantine, State quarantines (which are practically embargoes) would be in effect in nearly every State. Interstate business in such articles would operate under a severe handicap in the face of such a system of State embargoes.

2. Control Operations for Gypsy and Brown-Tail Moths.-- The work under this project is concerned with the control and extermination of infestations of gypsy and brown-tail moths which are so located as to be susceptible to spread by natural means to points outside the infested area. This work is carried on in cooperation with State agencies which make material contributions. The activities are carried on in the area immediately outside the known infested section, referred to as the Barrier Zone, and at points beyond where infestation has been found.

The Barrier Zone is an area some 20 to 30 miles in width, extending from Long Island Sound on the south to the Dominion of Canada on the north. This strip of land extends over into New York State for its western boundary and into the New England States for its eastern boundary, the center of the zone being approximately the eastern New York State boundary line. Spread of moths by natural means from the generally infested area in New England into and through the Barrier Zone is controlled by the application of extermination measures in this zone. This requires scouting to locate infestations and their treatment to eliminate colonies which may be found.

Gypsy and brown-tail moths have been kept confined to the comparatively limited area comprising the New England States. The gypsy moth has been found on Long Island and in the Bronx, N. Y., in northeastern Pennsylvania, and in New Jersey. These are the only known infestations for either of these insects outside of New England. The infestation in New Jersey is small and is believed to be due to a colony which was not found and destroyed in the course of previous work there. The nature of the work in these outlying infestations is similar to that employed in the Barrier Zone, consisting

of scouting to locate infestations followed by the application of suppressive measures with the object of complete extermination. The infestation in Pennsylvania was found in 1932. Cooperation of the States concerned is an important factor in the progress which has been made in dealing with these infestations.

Large allotments have been made available from emergency funds for the control of the gypsy and brown-tail moths. The supervision of this work is provided for by the organization employed under the regular appropriation.

EMERGENCY FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act, 1935:</u>		
Control and prevention of spread of brown-tail moth.....	\$69,440	---
Control and prevention of spread of gypsy moth.....	253,040	---
Total.....	325,480	---
<u>Emergency Relief Appropriation Act, 1936:</u>		
Control and prevention of spread of brown-tail moth.....	463,700	---
Control and prevention of spread of gypsy moth.....	2,002,000	---
Total.....	2,465,700	---
<u>Emergency Relief Appropriation Act, 1937:</u>		
Control and prevention of spread of gypsy moth.....	---	\$786,395
Total, Emergency Funds	2,791,180	786,395

(j) BLISTER RUST CONTROL

Appropriation Act, 1938.....	\$300,000
Budget Estimate, 1939.....	<u>280,000</u>
Decrease	<u>20,000</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. White-pine blister rust control operations:				
(a) Eastern control program...	\$112,122	\$135,800	\$115,800	-\$20,000 (1)
(b) Western control program...	112,386	149,200	149,200	- - -
2. Enforcement of quarantine on white-pine blister rust.....	9,795	15,000	15,000	- - -
Unobligated balance.....	3,697	- - -	- - -	- - -
 Total appropriation.....	 250,000	 300,000	 280,000	 - 20,000 (1)

DECREASE

(1) The decrease of \$20,000 in this item will involve a reduction in the control operations in the Appalachian region, principally in the southern part.

WORK UNDER THIS APPROPRIATION

General.--This appropriation provides leadership and technical direction for campaigns conducted for the suppression and control of white-pine blister rust by emergency funds allotted to the Bureau of Entomology and Plant Quarantine, by funds available to the Forest Service, National Park Service, and Indian Service and the work done by cooperating State organizations, counties towns, and individual land owners. These activities consist of eradication of Ribes (currants and gooseberries), which serve as carriers of the disease, and the application of measures to delay the spread of the disease into uninfected regions, including the enforcement of the Federal quarantine on white-pine blister rust.

This work is conducted under two main projects--one concerned with a control program and the other with the enforcement of the Federal quarantine on white-pine blister rust.

1. White-Pine Blister Rust Control Operations.--The work under this project provides national leadership for the control of the white-pine blister

rust and is carried on in cooperation with the appropriate agencies. For convenience, the work has been divided into two parts--Eastern Control Program and Western Control Program.

(a) Eastern Control Program.--The Department is cooperating in the control of blister rust through formal and informal arrangements with governmental agencies, States, counties, townships, individuals, and other local agencies in the control of white-pine blister rust in white-pine growing regions in Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, North Carolina, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Wisconsin, Maryland, Virginia, West Virginia, Ohio, Illinois, Indiana, Iowa, Tennessee, Kentucky, Georgia, and South Carolina. In this work the Department provides the leadership and coordination of the control activities and the States and their cooperators supply the supervision and labor. The work includes surveys to locate pines and areas where Ribes are growing; supervision of the work for control done by cooperating States, counties, and towns, or with emergency funds available to the Bureau or other agencies for white-pine blister rust control; and checking the eradication work to determine its thoroughness.

The eastern control program must be continued (1) to assure the productivity of white-pine forests containing standing timber valued at over \$126,000,000; (2) to preserve regional scenic and recreational white-pine values of great economic importance; (3) to protect thousands of acres of young growth which will form the next timber crop; (4) to maintain control of the disease on initially protected pine lands, aggregating 8,500,000 acres; (5) to apply control measures on the remaining unprotected pine acreage in the infected States; and (6) to extend protection to white pines in disease-free regions as rapidly as they are invaded by the natural spread of the disease. This is a national problem, requiring Federal leadership and technical knowledge to coordinate cooperating agencies.

(b) Western Control Program.--In the western area the control of white-pine blister rust is carried on in California, Idaho, Montana, Oregon, Washington, Wyoming, and Colorado. In this area the Department assists cooperating State and local agencies in the application of control measures on State and privately-owned lands and furnishes leadership and technical assistance in coordinating the control activities carried on in these areas by the Forest Service in protecting valuable white pines in the national forests, and to the National Park Service and Indian Service in protecting valuable areas of white pines in national parks and on Indian reservations. The forested lands in this area are of mixed ownership, and control can be accomplished only by combining and coordinating efforts of all owners into a single program. The work will include surveys to locate pines and areas where Ribes grow; application of methods of eradicating Ribes plants; supervision of control work done in the national forests and national parks and on private lands with funds supplied from other sources; and checking to determine the status of the control work.

The blister-rust control program in the western United States must be continued (1) to assure the productivity of forest lands bearing western white-pine and sugar-pine timber valued at \$288,000,000 and thus maintain

as maintain industries dependent upon the white pine, which represent 50 percent of the business of the western white-pine region, as well as valuable economic and business interests in the sugar-pine region of California; (2) to protect millions of acres of young growth that will form the next timber crop; (3) to prevent forced timber cutting and demoralization of the Nation's lumber markets; (4) to maintain control of the disease in areas already protected; (5) to apply control measures on the remaining unprotected areas; (6) to preserve the scenic and recreational white-pine values of great economic importance; and (7) to extend protection to white pines in uninfected regions as rapidly as they are invaded by the natural spread of the rust.

2. Enforcement of Quarantine on White-Pine Blister Rust.--The work under this activity is concerned with the enforcement of the Federal quarantine on account of white-pine blister rust. For the most part this work consists of (1) inspecting the premises and environs of nurseries in which pines susceptible to the disease are grown; (2) preventing the interstate shipment of rust-infected pines or currant and gooseberry plants likely to carry the disease and not meeting the requirements of the Federal quarantine; and (3) cooperating with nurseries, etc., in the protection of pine nursery stock against exposure to blister rust.

EMERGENCY FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act of 1935:</u>		
White-pine blister rust control.....	\$844,919	- - -
<u>Emergency Relief Appropriation Act of 1936:</u>		
White-pine blister rust control.....	2,834,625	- - -
<u>Emergency Relief Appropriation Act of 1937:</u>		
White-pine blister rust control.....	- - -	\$1,030,575
Total, Emergency Funds	3,679,544	1,030,575

(k) DUTCH ELM DISEASE ERADICATION

Appropriation Act, 1938	\$460,860
Budget Estimate, 1939.....	<u>378,489</u>
Decrease.....	<u>82,371</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. Dutch elm disease eradication:				
(a) Scouting to locate the Dutch elm disease.....	\$163,834(a)	\$321,164	\$287,933	-\$33,231 (1)
(b) Identification of disease in trees suspected to be infected with the Dutch elm disease.....	36,868	40,500	40,500	- - -
(c) Enforcement of quarantine on Dutch elm disease....	5,000	5,000	5,000	- - -
(d) Coordination of State work on the Dutch elm disease.....	55,056	55,056	45,056	-10,000 (1)
(e) Removal of diseased, dead, and dying trees..	- - -	39,140	- - -	-39,140 (1)
Unobligated balance.....	398	- - -	- - -	- - -
Total appropriation.....	261,156 (a)	460,860	378,489	-82,371 (1)

(a) Includes \$11,000 obligated in 1936 out of 1937 appropriation made immediately available and \$2,700 transferred to "Forest Insects."

DECREASE

(1) The Budget estimates contemplate a decrease of \$82,371 in this item, involving curtailment of work on the projects indicated above.

CHANGE IN LANGUAGE

The Budget estimates provide for the elimination of the phrase "to be immediately available," as this is no longer necessary.

WORK UNDER THIS APPROPRIATION

This appropriation provides for supervisory and administrative personnel and expenses for the eradication of the Dutch elm disease from the United States and for the enforcement of the domestic quarantine to prevent the spread of the

disease into uninfected regions. This includes scouting to locate the presence of the disease, the identification of suspected samples, the coordination of work done by various agencies, especially the cooperating States, and other activities concerned with the eradication of this disease which threatens the destruction of elms in the United States. The work of eradicating the Dutch elm disease is also supported by allotments of funds from emergency relief appropriations.

An important feature of the effort to eradicate the Dutch elm disease is scouting and locating its presence. The origin of the Dutch elm disease in the United States is traced rather definitely to elm burl logs imported for the manufacture of furniture veneer. These logs were known to be infested with the insects which carried the diseases and some were also infected with the disease. These logs were entered at a number of different ports and were sent to various localities to be cut into veneer. The beetles that were infected with the disease may have escaped to many points en route to the factory or in the vicinity of the ports through which they were imported. It is necessary to inspect the right-of-ways of railroads over which these logs were transported to locate the possible presence of trees infected with the Dutch elm disease. The largest center of infection occurs in the vicinity of New York Harbor comprising an area of approximately 50 miles in diameter in the States of Connecticut, New York, and New Jersey. In this area of heavy infection it is necessary to make intensive and repeated inspections to locate the presence of infected trees.

The external symptoms of the Dutch elm disease consist of the discoloration and wilting of the foliage. There are other diseases of the elm which also produce similar external symptoms. The only way to determine definitely that the tree is infected with the disease is to secure samples and culture them in a laboratory to isolate and determine the causative organism. It is essential that these laboratory examinations be made promptly so there will be no delay in the removal of the trees that are infected with the disease. Because of the infectious nature of the samples, it is essential that they be handled in such a way as to prevent possible contamination and prevent the infection of healthy trees.

The domestic quarantine placed on account of the Dutch elm disease prohibits the movement from the regulated area of logs, lumber, nursery stock, etc., which may carry the disease into uninfected regions.

The States in which infection has been located are cooperating in the eradication of the Dutch elm disease. They contribute funds and means for this purpose and provide the authority for the removal of infected or weakened trees and also carry out certain phases of the operation. An important part of the work carried on under the project is the coordination of the activities done by the various agencies, including States, to eradicate this disease.

EMERGENCY FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act, 1935:</u>		
Eradication of Dutch elm disease.....	\$179,427	- - -
<u>Emergency Relief Appropriation Act, 1936:</u>		
Eradication of Dutch elm disease.....	4,242,538	- - -
<u>Emergency Relief Appropriation Act, 1937:</u>		
Eradication of Dutch elm disease.....	- - -	\$1,724,040
Total, Emergency Funds	4,421,965	1,724,040

(1) TRUCK CROP AND GARDEN INSECTS

Appropriation Act, 1938..... \$381,580
 Budget Estimate, 1939..... 381,580

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Truck crop insect investi- gations.....	\$173,787	\$189,143	\$189,143
2. Berry insect investigations....	10,958	11,147	11,147
3. Sugar-beet leafhopper in- vestigations.....	74,106	74,390	74,390
4. Tobacco insect investigations..	63,375	63,900	63,900
5. Insects affecting greenhouses and ornamental plants.....	41,806	43,000	43,000
Unobligated balance.....	2,386	---	---
Total appropriation.....	366,418	381,580	381,580

WORK UNDER THIS APPROPRIATION

General.--This subappropriation provides for research to develop means of controlling insects injurious to truck crops and garden plants, including vegetables, flowers, bulbous plants, potted ornamentals, and plants grown under glass, as well as such related crops as strawberries, raspberries, blackberries, sugar beets, and tobacco. It also provides for

investigations on the European earwig, pests of mushrooms, and soil insects such as wireworms and white grubs attacking vegetables. These activities are under the direction of the Division of Truck Crop and Garden Insects Investigations, which has headquarters in Washington. Field laboratories are maintained in certain of the more important trucking regions and in localities where bulbs and other ornamental plants are produced.

1. Truck Crop Insect Investigations.-- The activities conducted under this project are concerned with insects affecting truck crops such as beans, peas, melons, potatoes, sweetpotatoes, onions, cabbages, etc. Investigations are now being conducted on a wide variety of insects injurious to truck crops, including cabbage worms, cucumber beetles, pepper weevil, Puerto Rican mole cricket, the European earwig, pea aphid, sweetpotato weevil, Mexican bean beetle, various wireworms, and white grubs. Certain phases of these investigations are carried on in cooperation with the Bureau of Plant Industry and the Bureau of Agricultural Engineering. The studies are carried on at 18 field laboratories located in various parts of the country. For the most part the investigations conducted at a laboratory cover a variety of problems and the laboratory may be considered as regional headquarters for work on truck-crop pests. For example, the pests of cole crops are studied at five different stations.

The determination of satisfactory methods for the control of insects affecting vegetable and garden crops necessitates investigations on many kinds of insects and crops. These studies are important to many large industries, including canning and marketing agencies, to the farmer producing trade crops, and to home gardeners. The development and expansion of the vegetable industry, the increased consumption of green food products, and the demand that these be free from insect damage and insecticidal residues are factors which have contributed to the increasing importance of this work. With the concentration of crops in certain areas old pests have increased in abundance and distribution. Many remedies which have been developed for the control of certain pests of truck crops required the use of insecticides containing arsenic. Where heavy infestations occur the pests cannot be satisfactorily controlled without leaving excessive residues. This coupled with the careless use of insecticides by growers emphasizes the need for developing methods of control which will not leave harmful residues. There is an increasing demand for information on the control of insect pests of vegetables, particularly for remedies which will not leave objectionable residues.

2. Berry Insect Investigations.--The work under this project is concerned with the study of insects injurious to the small fruits known as berries, including strawberries, raspberries, blackberries, etc. Work is carried on at two field laboratories -- one at Puyallup, Washington, for problems in the Pacific Northwest, and one at Chadbourn, N. C., for problems in the strawberry sections of the eastern Coastal Plain. In the Pacific Northwest special attention is being given to the development of measures to control the raspberry fruitworm and the raspberry mite. The work on these two pests is directed to the application of insecticides

which do not leave objectionable residues and to the method of applying them so they will be effective. Other important problems await study. Recently a European pest which attacks the ripe strawberry just beneath the cap has been causing damage in parts of the Pacific Northwest. The occurrence of large numbers of minute insects called thrips in cans of raspberries and related fruits produced in the Pacific Northwest emphasizes the need for studies to determine methods of controlling this pest, the occurrence of which has recently attracted particular attention.

At the Chadbourn laboratory in the eastern Coastal Plain special attention is being devoted to the control of the strawberry weevil and the strawberry root aphid. Work on the root aphid, which causes material losses and is apparently associated with one of the important strawberry diseases, is carried on in cooperation with the Bureau of Plant Industry. When the strawberry weevil occurs in such numbers that it cannot be controlled by cultural practices, it is necessary to apply insecticides. The present investigation is concerned largely with the use of derris and pyrethrum which do not leave objectionable residues.

3. Sugar-Beet Leafhopper Investigations.---The sugar-beet leafhopper is the most important pest of sugar beets in the western part of the United States and also damages vegetables. The periodic attacks of this insect result in almost complete failure of beets, tomatoes, beans, and squashes in certain areas and cause marked reduction in the yields every year. The leafhopper transmits the destructive disease known as curly top. One insect may transmit the disease to a number of plants. The leafhoppers invade fields in large numbers in the migration periods, and direct control in the fields has not been found practicable. The work on this insect in the different sections varies in scope and is divided into two work projects.

In the Intermountain Region the investigations are carried on from laboratories at Twin Falls, Idaho, Grand Junction, Colo., Phoenix, Ariz., and Salt Lake City, Utah. They consist principally of surveys made to determine the abundance of the beet leafhoppers and the availability of their favorite host plants in their natural breeding areas, studies to determine the value of sprays and trap crops, field studies and surveys to outline the main breeding areas, and modification of these due to natural or artificial causes.

In California the studies are concerned with the determination of the value of spraying wild host plants, with the elimination of breeding areas as a means of control, and the relation that populations of the leafhopper have to damage to tomatoes and other truck crops and the production of beet seed.

4. Tobacco Insect Investigations.---This work is concerned with the study of insects injurious to tobacco both in the field and in storage. It involves studies of the life history, habits, and methods of control

of such insects by the use of insecticides, attractants, baits, fumigants, cultural practices, etc.

The work on insects attacking tobacco in the field is now carried on in four of the main areas which produce various types of tobacco. The work in the dark fire-cured area is located at Clarksville, Tennessee; that in the flue-cured area at Oxford, North Carolina, supplemented by studies at Florence, South Carolina; that on insects attacking shade-grown tobacco at Quincy, Florida; and that on insects attacking tobacco used for cigar wrappers in Connecticut at Windsor, which is in cooperation with the State Experiment Station. Satisfactory controls that will not leave objectionable residues are not available for the control of many of the important pests, such as the hornworm and flea beetle. There is apparently some danger to tobacco users from insecticidal residues that may occur on the marketed product. Concerns purchasing tobacco for manufacturing purposes are giving attention to the amount of visible residue that may occur. This emphasizes the need of the development of controls which will eliminate objectionable residues. In the dark fire-cured area tests are under way to determine the practicability of the use of poison bait feeders as an aid in the control of the hornworm moth. Experiments to determine the effect of such insecticides as derris are under way, as well as studies to determine the possibility of using pyrethrum or other organic compounds. The type of bait most effective for the control of the sod webworm is also receiving some attention. The most important pest of tobacco used for cigar wrappers is the tobacco flea beetle. During the past season particular attention has been directed to the use of derris and cube dusts as a control for this pest and preliminary results indicate that these materials will be satisfactory for the control of this insect, at least when the value of the tobacco will justify their use. Attention is also being directed to the methods of control of the tobacco thrips.

Investigations on insects affecting tobacco in storage which have been under way for a few years were undertaken in response to the demand of the tobacco trade of the United States. They are chiefly concerned with the development of methods of controlling the recently introduced tobacco moth and the tobacco beetle in both the closed and open type of warehouses. Some very useful and interesting information has been secured and such conclusions as to control measures as have been developed have been made available to the trade. Aside from the protection of tobacco produced within the United States, these investigations have a bearing on the production of a product sufficiently free from insects to meet the requirements of countries to which American tobacco is exported.

The infestation in closed storages can be materially reduced by the use of traps and fumigants. It is not practical to apply these methods in the open storages, and studies are being made to determine other

measures of control such as the use of contact sprays. The practicability of using low temperatures is also being studied.

5. Insects Affecting Greenhouse and Ornamental Plants.--The work under this project deals with investigations to determine methods for controlling insects attacking flowering garden plants such as narcissus, tulip, dahlia, etc., and household and ornamental plants; insects injurious to flowers and all kinds of plants grown under glass; and insects injurious to mushrooms. There are many pests of these plants and in many cases the control which may be used successfully on one kind of plant cannot be used on other kinds of plants. In determining controls for a given insect pest it is necessary to test them on most of the kinds of plants attacked and to study the control in relation to the culture of the plant. Some of the pests of greenhouse and ornamental plants now receiving special attention are (1) the cyclamen and broad mites--insects extremely difficult to control which, according to a conservative estimate, cause annual losses to greenhouse interests approximating one million dollars; (2) insect vectors of important mosaic diseases of rose and narcissus--it seems likely that certain of these diseases are transmitted by insects which may be fairly easily controlled; (3) the iris thrips, a widely distributed pest especially difficult to control where the tubers are left in permanent locations; (4) the greenhouse red spider, a pest which attacks a wide variety of plants and causes losses throughout the country; (5) the gladiolus thrips--a limiting factor to the successful production of this favorite garden flower; (6) bulb mites--there are a number of mites which seriously injure narcissus bulbs and flowers for which satisfactory control measures are not available, and additional facts are needed before all varieties of bulbs can be disinfected to eliminate mites; (7) narcissus bulb flies--effective methods for disinfecting narcissus bulbs have been developed, but present methods of controlling the pest in the field are not fully effective.

The most important pest problems confronting the producers of mushrooms are maggots and mites. The control measures now available to the commercial producer are not fully effective. Conditions that must be maintained in the house for the satisfactory growth of mushrooms make it difficult to fumigate. Mite control is especially difficult because the fumigants ordinarily used do not penetrate the compost and reach the mite without injury to the mushroom. A sulphur burner has recently been devised which materially increases the opportunity for using sulphur in fumigating houses. Progress has also been made in the development of light traps. Further work, however, is necessary to make these results available to the producer. The chemical problems are being studied in cooperation with the Insecticide Unit.

(m) CEREAL AND FORAGE INSECTS

Appropriation Act, 1938.....\$364,329
 Budget Estimate, 1939.....363,669
 Decrease.....660

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. Cereal and forage insect investigations.....	\$249,747	\$253,214	\$253,214	- - -
2. European corn borer investigations.	78,858	78,968	78,968	- - -
3. Sugarcane and rice insect investigations.....	31,875	32,147	31,487	-\$660(1)
Unobligated balance.....	3,849	- - -	- - -	- - -
Total appropriation.....	364,329(a)	364,329	363,669	-660(1)

(a) Excludes \$7,900 allotted to "Foreign Parasites".

DECREASE

(1) A decrease of \$660 is possible by savings in rent for laboratory quarters at Houma, Louisiana. A general laboratory building is being constructed there by the Department during the present fiscal year under a Bureau of Plant Industry appropriation to house the various units engaged in the investigation on sugarcane problems.

WORK UNDER THIS APPROPRIATION

General.-- This appropriation provides for investigations on insects affecting cereal and forage crops, including sugarcane and rice, and the development of effective and economical methods for their control. Cereal and forage crops are the basis of agriculture over a large part of the United States. The insects attacking these crops annually cause immense losses, and in some areas crops may be completely destroyed by these pests. The investigations conducted under this item are directed by the Division of Cereal and Forage Insect Investigations from headquarters in Washington, D. C. The studies are conducted at field laboratories located in the important crop areas. The investigations are coordinated with those done by other agencies of the Department on these crops and also with that done by State agencies, certain problems being studied co-operatively.

1. Cereal and Forage Insect Investigations.-- This project provides for investigations to develop effective and economical means of controlling insects affecting corn, small grains (except rice), and forage crops. There are hundreds of kinds of insects which attack these crops. Some of these are injurious to both cereal and forage crops, others restrict their activities to single crops. The work now under way is separated into work projects referred to below:

The Hessian fly is the most important single insect pest of wheat. The amount of damage done each year varies with conditions. Surveys are conducted in cooperation with State agencies to determine the status of the pest and give timely information concerning control measures. Investigations are being conducted in cooperation with the Bureau of Plant Industry at certain State experiment stations to determine the varieties of wheat that are resistant to attack. An effort is being made to introduce certain parasites that occur in Europe and are not known to be established in the United States, and to redistribute parasites already established in certain areas in sections where they do not now occur and may be of benefit. The work on the Hessian fly is carried on at Carlisle, Pennsylvania; La Fayette, Indiana; Manhattan and Wichita, Kansas; and Sacramento, California.

The chinch bug is one of the important pests of corn, small grains, and other grass-like plants and occurs generally throughout the eastern half of the country. In favorable years it causes excessive losses. The studies on chinch bugs include those directed to determining varieties of corn and sorghum resistant to attack. These are conducted in cooperation with the Bureau of Plant Industry and certain State experiment stations. Those concerned primarily with the insect deal with the development of more effective measures to prevent the migration of the immature bugs from small grains to corn, the development of methods for determining chinch bug abundance, the determination of the effect of winter burning of grasslands, and the determination of the value of trap crops near small grains and the effect agronomic practices have on the abundance of the bugs. Work is headquartered at stations at La Fayette, Indiana, and Manhattan, Kansas.

The corn earworm is the most destructive generally distributed insect enemy of corn in the United States and occurs throughout the country wherever corn is grown. No satisfactory control is known either for field or sweet corn. Studies so far indicate that indirect methods may be useful in reducing the losses in field corn and that certain direct methods such as the application of insecticides may be effectively used for its control in sweet corn. Previous observations suggest that certain characters of the husk may offer partial immunity from attack. Studies are being made on varieties and strains to determine whether it would be practicable to carry on intensive breeding to produce relatively nonsusceptible varieties. Because of the importance of the corn earworm, the work on this pest has been reorganized and coordinated so as to place additional emphasis on the effort to develop effective controls.

The activities of the State experiment stations and other units of the Bureau which study it when it attacks other crops are being coordinated into a cooperative program. The field work on this insect as a pest of corn is directed from a laboratory at Urbana, Illinois, and special studies are carried on at Arlington Farm, Virginia, La Fayette, Indiana, and New Haven, Connecticut.

The range caterpillar is a native insect occurring in considerable sections of the Southwest, being particularly abundant in New Mexico where it seriously reduces range grasses, resulting in heavy losses to sheep and cattle producers in that area. Studies to determine the effect of native parasites, particularly their colonization in large numbers, indicate that this method of control would be impracticable in years of heavy outbreak. It may, however, be feasible to use such natural controls to prevent the building up of heavy infestations. Studies are now under way to determine the relation of the caterpillars to climatic conditions and the abundance of parasites, as well as the effect of various climatic and vegetational factors on outbreaks. This work is headquartered at Tempe, Arizona, but much of the actual operation is carried on during the active season from a substation at Las Vegas, New Mexico. It is expected that these investigations will be completed at the end of the following crop season and that this work project will be discontinued January 1, 1939.

There are many different species of insects which attack small grains and grasses. Among those which are now being studied are the black stem sawfly, the European wheat sawfly, joint worms, straw worms, etc. During the past two years the European wheat sawfly has occurred in outbreak numbers over considerable areas in Ohio and Pennsylvania and caused marked losses to wheat. An effort is being made to colonize an introduced parasite which materially aids in the control of this pest in Europe and is now being established in parts of Canada. The work is conducted from many laboratories. Those at Carlisle, Pennsylvania, and Sacramento, California, have during the past year directed special attention to these various pests.

Sunflowers are an important crop in portions of Illinois, Missouri, and New Mexico, and have been used as a substitute in cases of corn failure, particularly in areas along the river bottoms. Sunflower seed has been made practically worthless for oil production because of severe insect infestations. The pressing of oil from sunflower seed has practically been discontinued in the Illinois and Missouri areas because of the heavy losses caused by insects. Considerable data are available on the habits and development of the more important insect pests, and the work now under way is concerned primarily with testing methods of control under field conditions. Most of these field studies are conducted in Missouri.

There are many different kinds of insects which carry diseases of cereal and forage crops. At present particular attention is being directed to those insects which are thought to be carriers of the Stewart's disease of corn. It has been definitely determined that at least two species of

flea beetles transmit this disease and that certain other species of insects carry the disease over the winter. It is probable that these insects are the main source of carriers of the disease in the field. This work is carried on at the laboratory at Arlington, Virginia.

The alfalfa weevil is an introduced pest which occurs in a number of Western States. It has caused material losses in many sections and because of its importance has been the subject of State quarantines on the movement of alfalfa. During the recent drought years these quarantines have been of special importance because of the restrictions on the movement of hay. Studies on the alfalfa weevil are concerned with surveys to determine spread and occurrence, treatments that may be given to hay to eliminate the weevil, and the effect indirect methods of control--such as proper timing of cuttings--have on weevil abundance and damage. This work is headquartered at Salt Lake City, Utah, and studies are also carried on at Medford, Oregon, and Grand Junction, Colorado.

The alfalfa aphid causes severe losses in a number of the Middle Western and Western States which produce alfalfa. Its abundance is somewhat periodic, particularly in the Pacific Northwest. Direct control by insecticides appears impracticable. During the past two years certain strains of alfalfa have been discovered which are highly resistant to aphid attack. The study of these and other strains is now under way with the cooperation of the Bureau of Plant Industry and State experiment stations. Certain fungi attack the alfalfa aphid, and work is being done to determine whether it is possible to utilize diseases in field control. The work is carried on at Forest Grove, Oregon; Manhattan, Kansas; and Sacramento, California.

There are a number of insects which attack alfalfa and clover seed or interfere with its development. One of the most important is the alfalfa seed chalcid. An effort is being made to determine why recommended methods of control are ineffective in certain localities in the West where this pest is important. These studies require a determination of the relation of grasses and other vegetation to the presence of the pest in fields where seed is produced. This work is headquartered at Tempe, Arizona.

The various forage crops are attacked by many different insects. One of the pests now attracting considerable attention is the hairy vetch bruchid, an introduced insect at present limited to the Central Atlantic States, where it has caused high losses in seed production, in some counties as much as 50 percent of the entire crop. This insect lives in and may be transported in seed, and certain areas where vetch and similar crops are produced for seed are in need of information on control measures and ways of treating seed to prevent the spread of this pest. Other important insects which attack forage crops are the Western spotted cucumber beetle, an important pest of alfalfa clover seedlings in the Pacific Northwest, and the various leafhoppers which attack alfalfa and often cause heavy losses in the yield and reduce the vitality of plants so that they are injured by winter killing. Studies on miscellaneous insect pests of forage crops are directed from field laboratories at Arlington, Va., Forest Grove, Oreg., and Carlisle, Pa.

The importance of grasshoppers as pests of practically all kinds of cereal and forage crops has long been recognized and was again recently demonstrated by the extensive outbreaks in 22 States. There are many different species of grasshoppers that may occur in such abundance as to do excessive damage. When all the various kinds are abundant during the same season losses may be very great. Various species of grasshoppers differ in their habits, particularly as to associations favorable for egg-laying, and the reaction to various baits. The kinds which usually are present in cultivated fields are, in the main, quite different from the species which are so destructive to range lands of the Plains area. Only comparatively little attention is being given to these species except as they migrate into cultivated areas. Special attention is being given to determining more effective and economical baits, especially the development of those which may be substituted for the standard bran mash now recommended. Emphasis is also placed on ecological factors influencing the abundance of the grasshoppers and the habits of the various economic species. These activities are carried on at the following stations: Bozeman, Mont., Forest Grove, Oreg., Tempe, Ariz., and Sacramento, Calif.

One of the most effective ways to prevent the building up of large outbreaks of grasshoppers such as occurred during the past few years is to locate centers of incipient infestations and apply control before the infestation builds up to outbreak proportions. To secure information of this nature surveys are carried on in cooperation with various State agencies. In this work the States contribute approximately half of the cost. The information secured from the cooperative survey of the past season was, of course, available to the responsible State agencies and was the basis for the organization of cooperative control work this season. Without it, it would have been impossible to intelligently direct informational work about the outbreaks or distribute bait materials made available from various sources. The continuation of this survey work will develop facts which should serve as an insurance against further outbreaks and avoid the necessity for large appropriations for control. What is equally important, however, is that this survey work will also assemble data on occurrence and distribution in relation to environmental factors, information essential in the development of control measures, and a definite policy on ways of combating these important pests.

The Mormon cricket and its near relative, the Coulee cricket, have recently occurred in unusual abundance in certain sections in the Inter-mountain States. In combating these outbreaks the need for more effective and readily applicable methods for control was emphasized, as well as information as to the causes of outbreaks and the possibility of carrying on measures to prevent their occurrence. The work now under way includes studies to improve direct methods of control and observations on status and distribution.

White grubs, the immature stage of June beetles, are important pests of sod lands and cereal crops. Serious damage has occurred over considerable areas in the North Central States region in the past few years, and there have been heavy losses in many isolated sections throughout the United States. The damage is done by the grub and also by the adult beetle. There are many native species of white grubs. The life history of various forms differs--some species complete their life cycle in one year, while others may extend it for two, three, or four years. Methods now available for the control of white grubs are unsatisfactory. In an effort to develop more effective controls the work on these pests has been reorganized and coordinated under the direction of a new activity leader. The principal activities are headquartered at La Fayette, Ind., and Madison, Wis.

Cutworms, the larvae of various species of moths, annually cause material losses to cereal and forage crops. At present studies on cutworms are being carried on in the laboratory at Manhattan, Kansas, to determine the possibility of avoiding infestations by the method of handling the land during the period when eggs are being laid. Observations are made at various other places throughout the country to determine the flight period of various moths of species known to be of economic importance.

Many of the common pests of cereal and forage crops are attacked by fungus diseases. Comparatively little is known regarding these diseases or conditions under which they may become abundant. Investigations are conducted in the laboratory at Forest Grove, Oregon, to determine the possibility of using diseases of insects as an aid in control.

It is conservatively estimated that 5 percent of the cereals are destroyed or damaged by various insect pests during the process of milling and while the grain or products are held awaiting milling or shipping. These losses approximate \$300,000,000 annually and are caused by only a comparatively few species which occur throughout the world. Investigations on insects attacking grain during storage and milling are headquartered at Manhattan, Kansas. The studies are carried on in the main milling centers in the vicinity of Kansas City, Mo., and Minneapolis, Minn., and are directed to securing accurate information regarding more effective control methods. One of the standard ways of control is to fumigate, and special attention is given to determining the effect of various dosages of fumigants used, to devising more effective methods of applying fumigants, and to determining the practicability of using vacuum as an aid in eliminating infestation on mill products. These involve the determination of the temperature conditions under which fumigation can be effectively conducted in various types of mills and storages, as well as the effect of wind and other climatic factors on various fumigants and dosages. Some of the pests, such as the Mediterranean flour moth, are more easily killed than others and have led millers and others to develop erroneous ideas as to the effectiveness of standard treatments followed by losses due to the presence of other species which are difficult to control.

Many of the insect pests of cereal and forage crops were introduced into the United States during colonizations. Their natural enemies in many cases were left behind. Effort is being made to import these. At present special attention is being given to the importation of parasites of the Hessian fly and the European wheat sawfly. An effort is also being made to locate parasites of the hairy vetch bruchid and the alfalfa snout beetle, both of which are introduced pests which are attracting considerable attention. The latter is known to occur only in the general vicinity of Oswego, New York.

2. European Corn Borer Investigations.--- This project provides for the entomological phases of investigations on the European corn borer. Its objectives are the origination and perfection of effective and economical methods to control the pest and surveys to secure facts as to its status. Special attention is now being given to determine methods of controlling the insect by the use of insecticides. Work on varieties of corn resistant or tolerant to the borer is conducted largely at Toledo, Ohio, and one character of resistance in field corn has been definitely determined. This is being developed in strains, about 140 of which are being studied to select for fixation in varieties suitable for commercial use. Mechanical measures and cultural practices for control are being studied in order to perfect simpler methods and devices which may be used throughout the infested area. The colonization and introduction of parasites is directed largely to the establishment of these natural aids in areas where they do not now occur, especially in western Massachusetts, Connecticut, Long Island, New Jersey, and the newly infested sections of Maryland and Virginia. Surveys to determine general distribution, abundance, and status are continuing and form an important part of the work having a bearing on research and control activities.

3. Sugarcane and Rice Insects.---This project provides for investigations on insects attacking sugarcane and rice. Headquarters are maintained at Houma, Jeanerette, and Crowley, La.; Beaumont, Tex.; and Everglades, Fla. Special attention is now being given to the following activities:

The sugar cane moth borer annually causes very excessive losses to cane in the United States, reducing the yield by boring in harvested cane and injuring the stand by attacking seed cane. Studies are now under way to determine the susceptibility of different varieties of cane to moth infestation and to determine characters responsible for resistance and attractiveness. Indications are that certain varieties with a hard rind are less attractive and less susceptible to attack. Information regarding these varietal differences may offer a measure of protection from the cane borer. Studies on this insect also include the possibility of utilizing parasites as a means of control.

Certain insects transmit various diseases of cane, particularly the mosaic disease, which is an important limiting factor in the production of cane in Louisiana. The recent discovery of two other species of aphids which carry certain of the mosaic diseases may offer an explanation of the

variation in the severity of these diseases on different plantations and locations. The determination of further information about these vectors and their relation to native grass hosts, particularly those attacked by mosaic diseases, and the effect of attending ants on the abundance of aphids needs further study. Studies on the insect vectors of these diseases are being carried on in cooperation with the Bureau of Plant Industry.

Among the other insects attacking sugarcane are the sugarcane beetle, which also attacks rice and often causes material losses to both crops, the sugarcane mealybug, wireworms, and the lesser cornstalk borer. Investigations to determine methods of controlling these pests by artificial and cultural means are under way.

A condition known as "pecky" rice causes excessive annual losses. This condition is the result of feeding of various species of insects on the rice in the field, the results of which are evident on harvested and stored grain. Investigations to determine methods of controlling the insects responsible for this damage are under way. Studies are also being made of the rice stalk-borer and of insects which attack the crop in the field and remain with the harvested rice to do further damage in mills and warehouses.

Until recently practically no work had been done on the control of various insect pests of rice in storage. Experiments have been begun in a limited way to determine the effect of various fumigants and the dosage required to control some of the commoner pests in rice mills and in warehouses where rough and cleaned rice are stored.

EMERGENCY FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act of 1936:</u>		
Control and prevention of spread of Mormon crickets.....	\$333,000	- - -
<u>Emergency Relief Appropriation Act of 1937:</u>		
Control and prevention of spread of Mormon crickets.....	- - -	\$279,875
Total Emergency Funds.....	333,000	279,875

(n) EUROPEAN CORN BORER CONTROL

Appropriation Act, 1938.....\$32,939
 Budget Estimate, 1939..... 32,939

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Inspection and certification of products regulated by quarantines on the European corn borer.....	\$32,812	\$32,939	\$32,939
Unobligated balance.....	127	---	---
Total appropriation.....	32,939	32,939	32,939

WORK UNDER THIS APPROPRIATION

This item provides for the certification of products originating in the infested areas to meet the requirements of State quarantines on account of the European corn borer. To secure protection from the artificial spread of the corn borer, following the removal of the Federal quarantine, many States issued quarantines prohibiting or regulating the entry of products that may carry the borer from the infested area. Certain products may be safely moved after adequate inspection. To provide for this inspection and certification the Bureau is cooperating with various States and certifying such products going to States which maintain corn-borer quarantines but do not recognize State certification. There is no reason to anticipate that any developments now in sight will lead to fewer demands for certification.

(o) BARBERRY ERADICATION

Appropriation Act, 1938.....\$200,000
 Budget Estimate, 1939..... 200,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Eradication of the barberry in the 13 States where work was begun in 1918.....	\$177,504	\$174,550	\$174,550
2. Eradication of the barberry in other States.....	17,017	20,800	20,800
3. Inspection of nurseries which ship barberries interstate.....	4,650	4,650	4,650
Unobligated balance.....	829	---	---
Total appropriation.....	200,000	200,000	200,000

WORK UNDER THIS APPROPRIATION

Funds available under this appropriation provide for cooperation with States, individuals, and other agencies in the eradication of the common barberry, the intermediate host of black-stem rust fungus. The purpose of this work is to control black-stem rust of wheat, oats, barley, and rye and to prevent the occurrence of epidemics of this disease. This work consists of locating and removing bushes of those species or varieties of barberry which serve as intermediate hosts of the fungus. Federal funds are used largely for the supervision and coordination of the work of State and local agencies which supply labor and inspectors and share in the expenses of scouting. Barberries may resprout from portions of roots left in the ground or be produced from seeds which have lain dormant on the ground for some time. It is therefore essential that the areas be reinspected to insure that the plants have been eliminated.

The work of eradicating rust-susceptible barberries was begun in 1918 in the following thirteen States: Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming. During the past two seasons similar work has been undertaken in Missouri, Pennsylvania, Virginia, and West Virginia, financed largely from allotments of emergency funds. The work in these areas gives needed protection to local wheat-producing sections which in certain localities is of prime importance from a food standpoint and is largely in the nature of campaigns for local control. That done in certain sections also gives protection to the main wheat crop. This is especially the case in Missouri, where the work is centered in counties adjoining the Illinois and Iowa State lines.

A Federal quarantine prohibiting and regulating the movement of barberry plants is enforced, and a small part of this appropriation is used for the inspection of nurseries which ship barberry plants interstate. Certain varieties of barberry are immune to the disease and under appropriate inspection and certification can move without risk. The movement of rust-susceptible varieties is prohibited.

During the past three years the work of destroying barberry plants has been materially increased by special allotments of emergency funds available for relief. This work has put the program ahead a number of years, with corresponding benefits. All these activities have been and are being directed with the trained regularly-employed Bureau personnel, without which they could not be undertaken. The bulk of the regular appropriation is expended for this supervision, although a small portion of it will be used for the necessary checking of work being done, the coordination of work with local agencies, and the directing of appropriate educational campaigns.

The benefit from the eradication of barberry in wheat areas is well recognized, and farmers, farm organizations, milling and railroad interests, and farm-machinery groups support and endorse the work. State, local, and other agencies also cooperate and support it. There has been a steady reduction in the general damage from stem rust since the beginning of the campaign.

EMERGENCY FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act, 1935:</u>		
Barberry eradication.....	\$358,959	---
<u>Emergency Relief Appropriation Act, 1936:</u>		
Barberry eradication.....	1,584,750	---
<u>Emergency Relief Appropriation Act, 1937:</u>		
Barberry eradication.....	---	\$574,206
Total, Emergency Funds.....	1,943,709	574,206

(p) COTTON INSECTS

Appropriation Act, 1938.....\$144,544
 Budget Estimate, 1939.....144,544

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase or decrease
1. Cotton boll weevil investigations...	\$54,204	\$56,404	\$56,404	- - -
2. Investigations on miscellaneous cotton insects.....	51,938	52,125	56,090	+3,965(1)
3. Thurberia weevil investigations.....	9,965	7,965	4,000	-3,965(1)
4. Pink bollworm investigations.....	28,028	28,050	28,050	- - -
Unobligated balance.....	409	- - -	- - -	- - -
Total appropriation.....	144,544	144,544 (a)	144,544	- - -

(a) Excludes \$2,700 allotted to "Foreign Parasites".

(1) There is no change in the amount requested for this item. Certain adjustments are made in project allotments to provide for an urgent need for additional investigation of certain plant bugs which cause material losses and to which no effective control is available.

WORK UNDER THIS APPROPRIATION

General.-- This appropriation provides for investigations on insects which attack cotton plants and crude cotton products and for the development

or improvement of methods for their control. Cotton is one of the important agricultural crops and one on which the agriculture of the South depends. The products produced from cotton form an important part of industrial occupations in many sections of the United States. Cotton is attacked by many different kinds of insects. The importance of the various species varies with the season and the locality. One of the outstanding pests is the boll weevil. Investigations under this appropriation are carried on in cooperation with the States whenever practicable, but only comparatively few States are engaged in investigations on insects attacking cotton. Those phases of the studies having relation to other activities of the Department are carried on in cooperation with the interested bureaus. The work is directed by the Division of Cotton Insects, with headquarters in Washington, D. C., and field laboratories are maintained in localities favorable for the investigations.

1. Cotton boll weevil investigations.-- This project provides for investigations on the boll weevil, the most important cotton pest in the South, and the development and improvement of measures for its control. The scope of studies under way covers a wide field. Some of the more important lines of work under way are explained in the following paragraphs:

Cage tests are being made to determine the toxicity of new insecticides developed by other units of the Bureau. Similar tests are made for new combinations of insecticides which have been applied. Comparisons are made with the standard, calcium arsenate, and the effect these materials or combinations have on the cotton plant determined. These cage tests are used as the basis for field tests.

New and promising insecticides or combinations of insecticides are tested in the field in comparison with the measures now recommended. The standard insecticide, calcium arsenate, is not satisfactory under all conditions, and field tests are made to determine the possibility of modifying applications or adding other insecticides to each application to improve its effectiveness. The details for the control of the boll weevil differ in various parts of the cotton belt, and accurate information is not available for certain sections as to the most effective time to apply the standard calcium arsenate method to secure effective control. The field studies also include tests to determine practicability of reducing the amount of calcium arsenate in the earlier applications or of eliminating these applications and using instead molasses calcium arsenate mixtures or substitute sulphur or other non-arsenicals. The work is conducted from laboratories in South Carolina, Georgia, Mississippi, and Louisiana.

In certain areas, particularly those along the Atlantic Coastal Plain, calcium arsenate and other arsenicals appear to have a deleterious effect on certain types of soil. Studies are under way to determine the effect that insecticides used for control of the boll weevil have on cotton, forage, or truck crops that may later be planted in these soils.

Certain native parasites are known to attack the boll weevil, and studies are under way in cooperation with various States to determine the seasonal and geographical distribution and abundance of these parasites and to ascertain the relation they may have to other insects and environmental factors. These studies are for the purpose of determining whether it would be practicable to utilize these natural agencies in control. In certain

sections natural enemies contribute to reducing the weevil to such an extent that artificial control is seldom required. The reason for the effectiveness of various natural enemies in certain sections and not in others is not understood, and studies are under way with the hope of determining the factors which affect the abundance of natural enemies.

Studies are under way to determine the characters of the cotton plant which make certain varieties resistant to the boll weevil. The early development of tough carpel lining and the pilosity of the bolls seem to be characters which affect their suitability for oviposition by the weevil. This work is carried on in cooperation with the Bureau of Plant Industry at five experiment stations in Mississippi and two in Louisiana, with main headquarters at Stoneville, Mississippi.

The boll weevil is apparently largely restricted to cotton, but it will attack certain other malvaceous plants. Studies are under way at several laboratories to determine how important these varieties may be as hosts.

2. Investigations of Miscellaneous Cotton Insects.--- This project provides for investigations on the distribution, life history, and habits of many insects which attack cotton and the development of control measures for those which are particularly injurious. In some sections various native insects are more important as pests of cotton than is the boll weevil, and in all parts of the main cotton belt their control has to be considered and timed in connection with that applied for other pests. Some of the problems now receiving special attention are:

The cotton flea hopper and closely allied insects cause the cotton plant to shed squares. They are very important pests and often cause extensive damage over wide areas. In the Coastal Plain section of Texas the cotton flea hopper is the most important cotton pest. Investigations to determine methods of control by the use of insecticides and by cultural practices are under way. These studies are centered at Port Lavaca, Texas.

The cotton bollworm causes considerable damage to cotton and in many parts of the western section of the main cotton belt is considered the most destructive cotton insect pest. Studies to determine the relation of this pest to environmental factors, the effectiveness of insecticides or repellents to the moth, and the possible value of natural enemies are under way. Its control by insecticides is difficult, because they must be applied before the worms enter the bolls. Much of this work is carried on from the laboratory at College Station, Texas, and is done in cooperation with the Texas Agricultural Experiment Station.

Root aphids are pests of considerable importance in the eastern part of the cotton belt, particularly along the Atlantic Coastal Plain. Studies for control by cultural practices and insecticides are being carried on at Florence in cooperation with the South Carolina Experiment Station. There are at least three species involved, and the host habits, particularly the relation to certain weeds and grasses, have an important bearing on control.

Preliminary investigations indicate that Fusarium wilt of cotton may be disseminated by insects which occur commonly in cotton fields. Studies

to determine the part such insects may play in spreading these diseases are being carried on in cooperation with the Texas Agricultural Experiment Station.

A number of different species of true bugs attack cotton, often causing considerable loss by preventing setting of the squares or by discoloring the lint. They are especially important in regions where cotton is produced under irrigation, although they also cause material losses in the main cotton belt. Studies to determine the relation of these bugs to their native host plants and the practicability of controlling the insects by the use of insecticides or cultural means are under way, and considerable information has been assembled particularly as to their habits and hosts. There is need to expand these studies, and some adjustment in project allotments has been made for this purpose. Much of this work is being carried on in Arizona, with field headquarters at Tucson.

Comparatively little is known about the various soil-inhabiting insects which injure cotton. There are many different kinds, some of which cause considerable injury in certain localities. A study is under way to determine the species involved in various types of soils and to determine methods for control in sections where this is required.

Some of the native insect pests of cotton, such as the red spider, leaf perforator, crickets, and flea beetles occur in outbreak numbers periodically and cause important losses over considerable areas. Effective means of controlling many of these are not known. Studies to determine the life history and habits of these pests and how they can be controlled are under way in the various field laboratories, particularly those at Tallulah, La., and Florence, S. C.

3. Thurberia Weevil Investigations.-- This project provides for investigations of the life history, habits, and development of control measures for the Thurberia weevil, the western form of the cotton boll weevil, which is confined to the limited portions of the cotton-growing area of south-eastern Arizona and parts of Mexico. This insect is a dry-land form of the cotton boll weevil and has as its native host wild Thurberia cotton, which is generally distributed throughout the mountainous regions of the Southwest. This weevil has adapted itself to cotton and is a potential enemy to cotton production in the arid regions. Its habits differ from those of the boll weevil, and in limited areas around Tucson it has demonstrated that it can do material damage to cultivated cotton. Present studies are concerned with its distribution and its adaptation to cultivated cotton and to the development of control measures by the use of insecticides.

The investigations that have been conducted on the Thurberia weevil for a number of years have developed a large amount of information on its habits and the status of this insect in the limited area in which it occurs. Measures for its control have been developed which are effective for the area in which the Thurberia weevil now occurs. Should the insect become established in similar areas where cotton is produced under irrigation, methods of control should also be applicable to that region. With the continued effective enforcement of the quarantine it is believed the work on this insect can be curtailed. The amount allotted to this project for 1939 will be used largely for the continuation of certain field observations to

determine the status of the insect in its native host and for the preparation of reports setting forth the results of the investigations which will be concluded after the crop season of 1938.

Under allotments from emergency funds relief labor is being used to locate and destroy *Thurberia* plants in areas where the weevil occurs, and surveys are made to determine the effect that this work has on the status of the weevil, as to infestation both in *Thurberia* and cotton.

4. Pink Bollworm Investigations.-- This project provides for investigations on the pink bollworm to develop needed facts regarding its life history and habits and improve and develop new control measures which may be used in combating the insect in the limited sections of the United States where it has become established. These investigations will also serve as an insurance by providing additional information regarding means of controlling or eradicating this pest should it become established in new areas. The work is carried on in cooperation with the Texas Agricultural Experiment Station, the Mexican Department of Agriculture, and in Puerto Rico with the Office of Experiment Stations. Laboratories are located at Presidio, Texas, and Mayaguez, Puerto Rico. The following paragraphs briefly discuss some of the problems being studied:

Breeding and colonization of introduced parasites. Four parasites have been introduced from Egypt and two from Hawaii. These are being bred in the laboratory at Presidio and colonized in Puerto Rico and the heavily infested sections along the Mexican border in both the United States and Mexico. The more promising of these parasites have only recently been received and the work with them is just getting under way. Incidental studies on native parasites are also carried on as part of this activity.

The use of insecticides. This work is being studied in the laboratory and in the field to determine the toxicity of various materials and the possibility of applying them under field conditions to reduce or control this pest.

Studies on control by cultural means include experiments to determine the effect of plowing and irrigation on the overwintering larvae and to develop machinery which can be used in cleaning the field of crop remnants.

Observations on the life history and habits are being made to determine the effect of various conditions on survival and hibernation. These studies are being conducted in a large field cage, in which it is possible to control the infestation.

EMERGENCY FUNDS

Projects	Obligated, 1937
<u>Emergency Relief Appropriation Act, 1935:</u>	
Construction of field insectaries at Presidio, Texas.....	\$893

(q) PINK BOLLWORM CONTROL

Appropriation Act, 1938.....\$296,800
 Budget Estimate, 1939..... 296,800

PROJECT STATEMENT

Project	1937	1938 (Estimated)	1939 (Estimated)
1. Pink bollworm control operations:			
(a) Supervision of treatment and movement of cotton or cotton products as required by Federal quarantine on pink bollworm.....	\$110,943	\$121,437	\$121,437
(b) Inspection within regulated area to determine status of pink bollworm.....	33,954	22,996	22,996
(c) Inspection outside regulated area to determine possible presence of pink bollworm....	72,398	74,052	74,052
(d) Cleanup operation for control and eradication of pink bollworm.....	8,790	20,000	20,000
(e) Vehicular inspection to determine compliance with quarantine on pink bollworm.....	4,952	5,000	5,000
(f) Eradication of wild cotton in Florida for protection against infestation of pink bollworm..	44,748	53,315	53,315
Unobligated balance.....	1,054	- - -	- - -
Total appropriation.....	276,839	296,800	296,800

WORK UNDER THIS APPROPRIATION

This item provided for activities concerned with the prevention of spread of the pink bollworm from the infested area, including the enforcement of the Federal domestic quarantine; control operations in the area along the Mexican border contiguous to the infested area in Mexico; eradication activities in isolated points where infestation is detected; inspections to determine presence of the worm, surveys and control operations in Mexico in cooperation with the Mexican Government or local Mexican authorities; and other related work to protect the cotton culture of the United States from this pest.

The pink bollworm is one of the most destructive pests of cotton and is generally established in all important cotton countries except the United States. It occurs only in limited areas in this country but is a potential

menace to cotton culture over most of the United States. It is believed extermination of the insect throughout the infested area is possible except for those sections adjacent to sources of infestation in Mexico. Infestations have been eradicated from large areas in Texas, Louisiana, and Arizona. The area in the United States now known to be infested by the pink bollworm includes parts of Arizona, New Mexico, and Texas adjacent to the Mexican border where cotton is grown under irrigation and a few sections of the southern part of Florida where wild cotton occurs. The recently discovered infestation in the general vicinity of Brownsville, Texas, at the western end of the area of continuous cotton culture, is the only place where this important pest occurs in the main cotton belt. Inspections during the current season have disclosed a light infestation in new areas in Arizona. Inspections have not been completed as these notes are being prepared and it is not possible to indicate to what extent they may require extension of the regulated area in that State.

The quarantine requirements in various parts of the regulated area differ in some details, depending on conditions of infestation. In all areas the seed is sterilized and its handling at oil mills, etc., regulated. In some sections where the infestation is heavy the lint has to be fumigated and compressed before it can be shipped. All the gins, oil mills, and compress and fumigating plants in the infested area have to be supervised to see that they comply with necessary safeguards. All cotton products which may leave the quarantine areas have to be certified. These operations are closely associated with the marketing of the crop, the work must be handled in an effective manner to give required protection, and adequate provision must be made for the orderly handling of the crop.

There is need for careful and thorough inspection within the regulated areas to determine conditions of infestation. The regulations enforced differ as between lightly and heavily infested areas, and the determination as to this degree of infestation can best be made by gin-trash machines. Their use cannot be replaced by any other form of inspection with equal efficiency and economy. The cost to producers of compliance with the regulations in the sterilization of seed and lint is directly affected by the information obtained from the use of these machines within the regulated area.

The operation of the quarantine depends, of course, upon an accurate knowledge of the distribution of the pest. The fact that the pink bollworm does or does not exist in this country outside the regulated area must be determined for obvious reasons. The cheapest and most efficient way to do this would be through the use of gin-trash machines throughout the cotton-growing areas. Since this cannot be accomplished under the appropriation, the alternative is to provide a substitute for gin-trash inspection through the collection of bolls from all areas of the main cotton belt. These are kept in preservatives and inspected in laboratories.

The development of machines capable of segregating gin trash, leaving the larvae of the pink bollworm readily exposed to view in an almost negligible quantity of trash, has brought this type of inspection to a point which justifies its consideration as an item altogether separate from that of scouting, although it is an essential part of the scouting work. These machines have been improved from year to year and are now mounted on trucks, which enables them to be moved readily from one location to another. Since it is not

necessary to tear down and set up the equipment, machines may be moved from gin to gin or locality to locality under their own power as circumstances may require, and the efficiency of the work is greatly increased. The use of these machines at gins in and out of the regulated area furnishes a more comprehensive knowledge of the pink bollworm conditions throughout the entire cotton belt. Inspections with the aid of the gin-trash machine furnishes the most positive evidence with respect to the presence or absence of the pink bollworm in a given locality. It is this inspection on which greatest reliance is placed for the finding of infestations of pink bollworm before they have time to become thoroughly established and spread over considerable areas.

The laboratory inspection and gin-trash inspection are supplemented by a third method of determining the presence or absence of the pink bollworm. This third method consists of field inspection. It is used in areas outside the regulated area where some reason exists for suspecting the possibility of infestation and where it is important to discover this infestation at the earliest possible moment, and where the infestation must be traced to definite fields of growing cotton.

The heavily infested section is in the vicinity of Presidio, Texas. Cotton heavily infested with the pink bollworm in Mexico is separated only by a little more than the width of the Rio Grande from growing cotton in the United States, infestation being heavy on both sides. A general program of suppression and control is maintained in this area on the American side of the border. This includes field cleanup and other operations to reduce the infestation and the hazard of spread because of the occurrence of large numbers of moths and worms. On the Mexican side of the line agricultural officials and growers are watching the progress of the work across the river, and good cooperation is being received, there being a rather general and concerted attempt to follow the cleanup procedure.

The danger of spread by the movement of seed and lint by truck or similar means from the heavily infested section in the Big Bend Section of Texas is markedly greater than from the lightly infested sections. To prevent such movement road stations are operated in cooperation with the State on the important roads leaving the heavily infested section.

A very heavy infestation was found in 1931 in wild cotton growing in parts of southern Florida and work was begun to remove this wild cotton which is of no commercial value. At the outset, the wild cotton most accessible to the average resident or tourist was removed first, gradually working back to more remote locations. It is believed that most of the wild cotton has been located. Experience, however, has shown that some of this cotton will sprout from portions of the roots which were not removed, and it also comes from seed remaining in the soil. This necessitates going over the ground several times. Work on the removal and destruction of wild cotton can be done only during the drier seasons. While the activities of the past season were materially increased by an allotment from emergency funds, it will be necessary to continue until the wild cotton has been removed from this area.

EMERGENCY FUNDS

Projects	Obligated 1937
<u>Emergency Relief Appropriation Act of 1935:</u>	
Eradication of wild cotton.....	\$6,094
<u>Emergency Relief Appropriation Act of 1936:</u>	
Eradication of wild cotton.....	34,000
Total, Emergency Funds.....	40,094

(r) THURBERIA WEEVIL CONTROL

Appropriation Act, 1938.....\$2,808
 Budget Estimate, 1939..... 2,808

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Enforcement of Thurberia weevil quarantine.....	\$2,800	\$2,808	\$2,808
Unobligated balance.....	8	---	---
Total appropriation.....	2,808	2,808	2,808

WORK UNDER THIS APPROPRIATION

This item provides for the administration and enforcement of the Thurberia weevil quarantine, which regulates the movement of cotton and cotton products from the two counties in Arizona where this pest is known to occur. The work involves supervising the handling, treatment, and movement of cotton, cottonseed, and other articles likely to carry the Thurberia weevil into uninfested regions. The Thurberia weevil is a native variety of the Mexican boll weevil and occurs in limited areas in Arizona and parts of Mexico. Under natural conditions this native insect lives on wild Thurberia cotton. With the production of cultivated cotton in the area it has become attracted to this crop. The weevil has demonstrated capacity to breed in cultivated cotton and, because of its ability to live under arid conditions, is a menace to cotton grown under semiarid conditions. The expenditures for the enforcement of the quarantine are of a continuing nature and are the minimum required to meet conditions.

The removal of *Thurberia* plants from the uncultivated areas in the region where infestation occurs, which was begun in 1935 with emergency funds, has continued. This destruction of the wild host of the weevil, which is a plant of no economic importance, may reduce the possibilities of infestation in commercial cotton, thus lessening the opportunity for spread. The actual effect that this work may have on the abundance of the weevil is not yet known, and it is not possible to make any immediate modifications in the quarantine requirements to safeguard the spread of the weevil.

EMERGENCY FUNDS

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act of 1935:</u>		
Locating and destroying <i>Thurberia</i> plants...	\$43,247	- - -
<u>Emergency Relief Appropriation Act of 1936:</u>		
Locating and destroying <i>Thurberia</i> plants...	93,750	- - -
<u>Emergency Relief Appropriation Act of 1937:</u>		
Locating and destroying <i>Thurberia</i> plants...	- - -	\$39,426
Total, Emergency Funds.....	136,997	39,426

(s) BEE CULTURE

Appropriation Act, 1938.....\$83,000
 Budget Estimate 1939.....83,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Bee culture and apiary management.....	\$74,906	\$83,000	\$83,000
Unobligated balance	594	- - -	- - -
Total appropriation...	75,500	83,000	83,000

WORK UNDER THIS APPROPRIATION

This item provides for investigations on the habits and management of bees to make the production of honey and wax more profitable and to facilitate the pollination of fruits and vegetables and forage crops by the use of honeybees; and for the issuance of permits and inspections in connection with adult honeybees imported into the United States under the Act of 1922 governing the importation of adult honeybees. This is the only specific appropriation made by the Federal Government which provides assistance or aid to the beekeeping interests in the United States, the annual value of which may be conservatively estimated at \$100,000,000. Only fourteen States carry on investigations in the field of bee culture and these activities are coordinated with those done under this appropriation. The States look to the United States Department of Agriculture to supply them the necessary information regarding the management of bees, control of their diseases, and satisfactory and effective handling of them in the pollination of plants and production of honey and wax.

Headquarters for the work carried on under this item are maintained at the laboratory at Beltsville, Md., where general investigations are conducted. This laboratory also studies problems affecting beekeeping in the Eastern States. Field laboratories are located at Laramie, Wyo., Baton Rouge, La., and Davis, Calif., to investigate problems peculiar to these regions and also to study the effect of regional conditions on problems occurring throughout the United States. Investigations on certain special problems are also carried on in cooperation with State agencies in Iowa, Texas, and Wisconsin.

Diseased bees or samples of broods from diseased colonies are sent from all parts of the United States to the Beltsville, Md., laboratory for diagnosis. This work is of a service nature and is essential to the beekeeping interests of the United States. Live bees imported into the United States under permits are examined at the Beltsville laboratory to see that they are free from disease and meet the requirements of the law and regulations governing the importation of living bees. The diseases of bees are studied at various laboratories, especially those at Beltsville and Laramie. These investigations include studies on the life history of the diseases, especially para-foulbrood, recently discovered in several Southeastern States, and the means by which they may be combated. Emphasis is now placed on the way diseases may spread through beeswax and honey and the relation of the location of infection to sources of infectious honey. Special attention is directed to the possibility of combating American foulbrood through the development of resistant strains of bees. These special studies are being carried on cooperatively with State experiment stations of Iowa, Wisconsin, Wyoming, and Texas.

Studies are under way at the laboratories at Baton Rouge, La., and Beltsville, Md., to develop improved strains of bees, attention being directed primarily to producing bees which have greater longevity and greater honey-carrying capacity; bees with longer tongues so they will be more effective in the fertilization of plants, such as clover; and bees which will be more hardy in northern climates and strains which will be active under adverse weather conditions.

In cooperation with the Bureau of Agricultural Economics and the economic divisions of State experiment stations and colleges, investigations

are under way to secure the necessary information regarding the economic aspects of the beekeeping industry in the Pacific Coast States. The work in California is carried on in cooperation with the economists of the Giannini Foundation, and that in Oregon is carried on in cooperation with the State agricultural experiment station.

Studies are under way to determine the regions producing the most satisfactory honey flora and the time when honey plants are available from the standpoint of honey production. Studies to determine the types of honey produced by various plants are also under way. A limited amount of work is being done to determine the value of honeybees in pollinating certain deciduous fruits. The effect of certain poisonous plants and their relation to beekeeping are also being studied.

The shipment of bees in two- and three-pound packages with queens is a relatively new and rapidly growing industry. Such shipments permit the prompt establishment in northern States of vigorous colonies at a time when they are most needed for the pollination of various fruit trees. It also permits the strengthening of colonies which have become weakened due to adverse weather conditions occurring through many areas during the winter. Considerable loss has occurred in the shipment of bees, and there has been constant litigation between the shippers and the express agencies. Investigations are now under way to determine the best methods of handling colonies to develop satisfactory shipping containers and food that may be used in transit, as well as methods of caring for the packages at destination or at transfer points.

Limited attention is given to a number of other problems to develop at least preliminary data needed in relation to the work on other activities. One of these has to do with flight habits, another with colony population, and still another with the effect of a reserve supply of pollen. Studies on beeswax are also carried on in cooperation with the State agency in California.

(t) INSECTS AFFECTING MAN AND ANIMALS

Appropriation Act, 1938.....\$182,600
Budget Estimate, 1939..... 182,600

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Investigations on insects affecting man.....	\$43,608	\$54,623	\$54,623
2. Investigations on household insects.....	14,341	14,475	14,475
3. Investigations on insects affecting animals.....	88,246	109,902	109,902
4. Investigations on insects affecting poultry and wildlife.....	3,193	3,600	3,600
Unobligated balance.....	760	- - -	- - -
Total appropriation.....	150,148	182,600	182,600

WORK UNDER THIS APPROPRIATION

This item provides for investigations on insect pests attacking man or injuring him by carrying diseases, including those insect pests which annoy him in his habitation or destroy household supplies, fabrics, etc. It also provides for investigations on insect pests of farm and range animals, poultry, birds, and wild birds and animals and the development of methods for their control or eradication. Activities are carried on independently or in cooperation with the Public Health Service, Bureau of Animal Industry, and Bureau of Biological Survey of the Department of Agriculture. The Bureau of Entomology and Plant Quarantine is, however, responsible for the investigations on insects.

1. Investigations on Insects Affecting Man.--- The work under this project is concerned with investigations on insects which annoy man by direct attack or injure him by carrying diseases. Only a few of the more pressing problems are now being studied. The most important of them are explained below:

Mosquitoes as a class are the most important insect pests known to man. They are responsible for carrying such dreaded diseases as yellow fever, malaria fever, dengue fever, etc. There are many different kinds of mosquitoes and no one control measure is equally effective for all kinds. The habits of some of the commoner forms are fairly well known and means of control have been developed. The habits of many kinds are known only in a general way and effective controls are not available. Even with the commoner forms methods of control depend on various local conditions. The planning for control campaigns requires technical assistance, and at present the requests for advice can only be partially met. The studies under way are conducted from Portland, Oreg., Savannah, Ga., Orlando, Fla., and Washington, D. C. Those in the Pacific Northwest are concerned largely with forms in flood water and those in Georgia and Florida with salt marsh forms, although in Florida attention is also being given to the group of mosquitoes which obtains its air through plants rather than coming to the surface of the water. The work done from Washington has special relation to the transmission of equine encephalomyelitis by mosquitoes.

Sand flies are not known to carry diseases. They are, however, of prime importance to man in certain sections of the country, particularly along the southeast seaboard. Investigations under way are headquartered at Savannah, Ga., although some studies are also made in Florida. The habits of only a comparatively few species of sand flies are known and for some of them no effective control measures are now available. It is, however, now possible to suggest control measures that will materially reduce the numbers of certain species. The value of these methods should be further tested and a way devised to combat those living in trees and to determine the effect of pumping out diked areas.

Eye gnats transmit a dangerous eye disease which is especially common among children of school age. These pests are particularly troublesome in parts of the Southern States and in certain regions in California. Recent investigations in California have developed means for partial effective control measures for that locality and work there has been suspended. Observations are being made in the winter garden area of Texas where a severe condition exists and in localities in the Southern States.

The larvae of certain blowflies are used by surgeons to clean out and heal certain types of wounds, particularly bone lesions. In this work it is essential that they have available a constant supply of sterile maggots. The development of safe and economical methods of rearing and transplanting these maggots has been investigated and ways of safe handling developed. It has been found that excretions from the maggots may have a beneficial effect, and this subject is now being studied.

Certain ticks, including the common dog tick, transmit Rocky Mountain spotted fever. Studies are under way to determine the habits of these and other kinds of ticks so as to determine facts which may aid in developing methods for their control. Investigations on dog ticks in New England in the vicinity of Martha's Vineyard were begun this season to develop measures which may be applied for control.

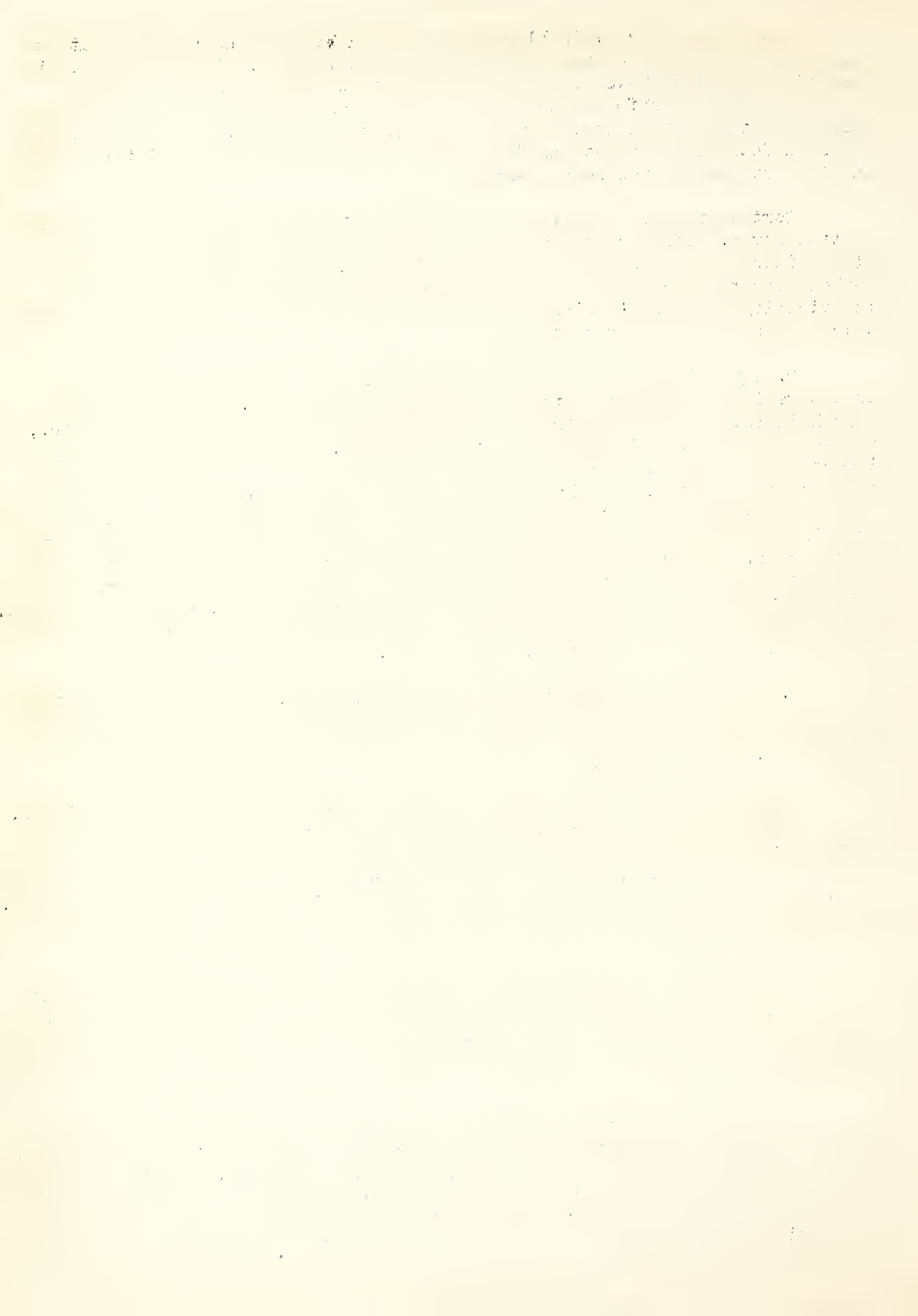
2. Investigations on Household Insects.-- This project provides for investigations of insect pests in dwellings, hotels, etc., those annoying householders, and those destroying household supplies, drugs, fabrics, etc., and the development of methods for their control. There are many kinds of insects which annoy man or destroy his household possessions. The habits of these differ greatly. The habits of the same species may even differ under various conditions of artificial environment. The development of control measures is complicated because of the wide variety of conditions under which the pests occur. Special attention is now being given to the development of more effective methods of control by fumigation, the use of safe fumigants, and the determination of conditions under which various fumigant materials may be used. These studies also involve determining the effect proposed controls may have on products in storage, households, stores, etc.

3. Investigations on Insects Affecting Animals.-- This project provides for investigations on insects injurious to horses, cattle, sheep, goats, swine, and other domestic animals, as well as game animals, and the development of methods for their control.

Screwworms are pests of cattle, sheep, goats and various other animals, causing immense losses, particularly under range conditions. The studies conducted with allotments from regular funds are carried on at field laboratories in Texas and Georgia. About 90 percent of the screwworm infestations are caused by the species recently defined, which restricts its breeding to live animals. The habits of this species are different from those of the composite species and should be studied in detail and more effective controls developed.

The larvae of certain flies, commonly known as cattle grubs, not only greatly injure hides but materially interfere with the effective management of dairy and range cattle. The annual losses from these insects are estimated at as high as \$50,000,000. Studies of methods for controlling these pests are under way.

The larvae of certain flies commonly called horse bots cause material injury to horses and related animals and also greatly reduce their efficiency. These losses are much more serious than previously supposed. Recent investigations have developed new facts regarding the life history of these pests which will apparently have important relation to control operations. More complete information on the habits of these pests and methods of preventing infestation are particularly needed.



The sheephead bot materially lowers the vitality of the infested animal and in many cases causes its death. Goat lice do a great amount of injury to the hair, particularly mohair, and also reduce the vitality of the animals. The losses caused by these pests to sheep and goat raisers are great, and there is an insistent demand for effective control measures. Experiments to determine the value of certain volatile materials and sulphur are under way, but the effect of these possible treatments on the animals and insects needs further study.

Many of the fly sprays now used on farms to protect livestock, particularly dairy cattle, are valueless and even detrimental to cattle and to dairy and other food products. Investigations are now under way to develop a more effective and cheaper spray. If successful, this work will be of material aid to the livestock and dairy industry, and besides controlling flies, will tend to reduce the opportunity for disease.

A number of species of ticks are detrimental to animals. Wounds caused by some ticks (such as the common ear tick) to cattle provide entrance places for other pests, such as screwworms. Information on the distribution and habits of these species is not well known and no satisfactory control measures are available for several important species.

4. Investigations on Insects Affecting Poultry and Wild Life.--- This project provides for investigations on insect pests and mites which attack poultry and wildlife. Studies which have been conducted have developed measures for the control of certain of the more important insect pests of poultry, and the limited funds are used also entirely to investigate various forms which attack wild animals, special attention being given to the effect the fire ant has on the nesting habits of game birds in the South. These investigations are carried on in cooperation with a game protection association and are headquartered at Thomasville, Ga. Observations are also made on other insects attacking wild animals, especially those which cause wounds which predispose attack by screwworms. The various insect pests of poultry levy a heavy toll on poultry owners in spite of methods of control already developed. The amount of these losses and their distribution over the entire country justify the effort to continue to develop control measures to supplement those now recommended, and a very small part of the allotment is used to purchase supplies for tests which may be made at various laboratories incidental to other work.

(u) INSECT PEST SURVEY AND IDENTIFICATION

Appropriation Act, 1938.....\$159,790
 Budget Estimate, 1939..... 159,790

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Insect pest survey.....	\$9,519	\$19,559	\$19,559
2. Identification and classification of insects.....	120,195	140,231	140,231
Unobligated balance.....	84	---	---
Total appropriation.....	129,798(a)	159,790	159,790

(a) Excludes \$5,000 allotted to "Foreign Parasites."

WORK UNDER THIS APPROPRIATION

General.-- The work prosecuted under this item is essential to the various activities of the Bureau and involves identification of specimens and the recording and distribution of facts regarding the prevalence and abundance of economic insect pests. The activities are grouped under two projects, as follows:

1. Insect Pest Survey.--These activities are concerned with (a) the assembling, recording, analysis, and maintenance of permanent records on insect abundance and damage; (b) the maintenance of records of the occurrence and distribution of insect pests in foreign countries--information necessary in connection with the enforcement of quarantines regulating the entry of plants and plant products; and (c) the publication of a monthly bulletin on current insect conditions and an annual summary of the conditions which occur throughout the United States.

Information on insect conditions throughout the country is supplied through cooperative arrangements with entomologists of the Bureau and State entomological agencies. These cooperators furnish notes on the occurrence and relative abundance of insect pests in their respective regions. The assembling and redistribution of current information on insect conditions is of importance to the Bureau but is also useful to State workers in forewarning them of menacing insect conditions occurring in neighboring areas.

2. Identification and Classification of Insects.--This project is of a continuing and service nature of vital importance to economic entomology. It includes the identification, classification, and description of insects in both the adult and immature stages. Accurate and authoritative information on the identity and relationships of insects is required in the daily work concerned with research on insects, with control activities, and with the enforcement of plant and animal quarantines. Without this information it would be impossible

to conduct many of these activities in an effective manner. The prompt recognition of the numerous insect pests is essential and this can be done only by specialists. This activity plays an important part in the economic work on insect pests carried on by other governmental agencies, State agricultural colleges and experiment stations, universities, etc., in this country and elsewhere. In connection with these activities investigations are also carried out on the anatomy and structure of insects. The proper understanding of the characters by which the hundreds of thousands of kinds may be distinguished is essential.

(v) FOREIGN PARASITES

Appropriation Act, 1938.....\$38,000
 Budget Estimate, 1939..... 38,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Foreign Parasite Introduction.....	\$27,673(a)	\$38,000	\$38,000
Unobligated balance.....	327	---	---
Total appropriation.....	28,000	38,000	38,000

(a) This item was established in the Act making appropriations for 1938 to provide for recurring expenses incident to the collection and importation of natural enemies of insect pests. These activities were authorized and provided for in previous appropriations, the amounts used for recurring expenses under the several items for 1937 being as follows:

Fruit Insects.....\$7,900
 Forest Insects..... 4,500
 Cereal and Forage Insects. 7,900
 Cotton Insects..... 2,700
 Insect Pest Survey and
 Identification.... 5,000

Total..... 28,000

WORK UNDER THIS APPROPRIATION

This appropriation provides for administrative expenses connected with the introduction of natural enemies of injurious insects and related pests and for the exchange with other countries of useful and beneficial insects. This includes operating expenses of a laboratory in the United States which serves as a receiving center for the natural enemies imported from foreign countries and for the expenses of maintenance and operation of field laboratories in foreign countries which serve as a center for exploration to locate useful, beneficial insects and activities associated with their assembling for shipment to the United States.

The value of natural enemies as aids in controlling injurious insect pests has been amply demonstrated by work done over a period of many years. The use of natural enemies as possible aids in combating insect pests is a definite part of investigations to develop means for the control of injurious forms, particularly those which are not native to the section where they cause damage. Many of the major insect pests of the United States were introduced with the early development of agriculture. Except in a few instances their natural enemies did not accompany the introductions. Studies of their natural enemies and their native habitat and their collection and assembling for shipment to the United States require especially trained personnel and many contacts with the appropriate officials in foreign countries. To do this it is necessary to maintain laboratories with appropriate facilities in foreign countries. At present there are two such field laboratories, one in Europe and the other in Japan. It is also necessary that appropriate facilities and trained personnel be available in the United States to receive shipments of natural enemies and hold them under quarantine conditions to assure the absence of injurious insects before they are released in the United States. The insects for which natural enemies may be sought attack a wide variety of crops.

The expenses, other than those of a recurring and administrative nature, connected with the importation of parasites are provided for from the appropriations made for studies and prevention of spread of particular pests.

(w) CONTROL INVESTIGATIONS

Appropriation Act, 1938.....\$62,518
 Budget Estimate, 1939..... 72,518
 Increase..... 10,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Increase
Control investigations...	\$62,061	\$62,518	\$72,518	+ \$10,000 (1)
Unobligated balance.....	457	- - -	- - -	- - -
Total appropriation...	62,518	62,518	72,518	+ 10,000 (1)

INCREASE

(1) The increase of \$10,000 in this financial project is apparent rather than actual. It is provided for by transfer, with offsetting reduction of \$10,000 appropriated under the item "Fumigation Investigations" and is for investigations for the control of insects by fumigation.

The Act making appropriations for the fiscal year 1938 includes an item entitled "Fumigation Investigations". This item provided for investigations for the development of fumigants to be used for fumigating plants and plant products, the interstate movement of which is now restricted or prohibited by State quarantines. A limited portion of the funds provided under the item "Control Investigations" is used for activities of the same character as those conducted under the appropriation "Fumigation Investigations". In order that the activities may be brought under one project and fitted into the uniform project system of the Department, it is recommended that the separate item "Fumigation Investigations" be discontinued and funds provided by it transferred to and made a part of the amount allotted for such work under the item "Control Investigations". This involves transfer of personnel and expenditures under the item "Fumigation Investigations" to the item "Control Investigations."

WORK UNDER THIS APPROPRIATION

This appropriation provides for investigations to develop new materials which may be useful for the control of insect pests; research concerned with the commercial application of methods developed for the sterilization or disinfection of plants or plant products; and the coordination and standardization of methods of disinfection of articles or products the movement of which is regulated by various plant quarantines. The basic information secured by these investigations is applicable to many lines of work on the control of plant pests. The studies provided for have an intimate relation to much of the research, control, and quarantine enforcement work of the Bureau and may cut across crop and divisional lines. In such cases the work is cooperative and closely coordinated with that done by other units. The activities concerned with the sterilization or disinfection of quarantined articles include investigations to develop methods, by fumigation, the use of heat, and other means which will permit freer movement of the regulated articles without endangering the spread of pests.

The various lines of investigation have many related aspects and are grouped under one project. The more important activities now under way are discussed briefly in the following paragraphs:

Investigations to determine the application, under varying conditions, of gaseous insecticides in the destruction of insects of economic importance are concerned primarily with methods of commercially applying fumigants for the treatment of products covered by quarantine regulations. These studies aim to develop treatments by fumigation which will make it possible to treat products the movement of which is now prohibited or restricted by quarantines so that they can be imported or moved interstate without accompanying risk of spreading infestations of insects which are the subject of quarantine.

Certain insect pests which may occur in many of the products regulated by quarantine can be killed by the use of heat or cold, and this method of sterilizing plants or plant products is used in connection with certain Federal quarantines. The commercial application of these methods requires constant technical supervision and standardization. An important part of the work carried on under the project consists of furnishing this type of service to the unit responsible for the enforcement of the quarantine. Certain pests

not regulated by quarantine may be combated by the use of heat and cold. Experiments to determine the effect of heat or cold on insects, and especially those forms that may be moved in connection with commercial shipments, are carried on in cooperation with other divisions of the Bureau.

With the development of new insecticides there is need to determine effective ways of applying new materials. Studies on the development of machinery or equipment used in applying insecticides are a part of the activities which come under this project. At present most of the attention is devoted to the modifying of machinery in applying insecticides used in control operations against certain major pests such as the gypsy moth. These and related studies are carried on in cooperation with other divisions of the Bureau.

An important part of the work under this project consists of testing new materials to determine their effect on insects. New materials developed by the chemists are tested under laboratory conditions on various types of insects and plants to make a preliminary determination of the effect of new compounds on the insects on plants. The materials tested include not only those synthesized by the chemists but also the extracts of various plants thought to contain properties of insecticidal value. These studies go hand in hand with the investigations on the chemistry of insecticidal materials and form the bases for suggestions for new materials or methods that may be useful against particular crop pests. Materials which promise to be of value are given further tests at field laboratories concerned with the control of the insects for which they may be applicable. Two kinds of insects, which can be made available in large quantities throughout the year and are particularly susceptible to poisons, are used in these tests. These are mosquito larvae and the southern army worm. In addition to testing material developed by the chemists, these laboratory tests are intimately associated with the activities concerned with the development of strains or varieties of plants which contain insecticidal properties. The breeding work of the Bureau of Plant Industry to develop strains or varieties of the native plant known as devils' shoestring (Cracca virginiana) to increase the amount of the active insecticidal properties must be correlated with tests on insects to determine the toxicity of these materials.

A thorough knowledge of the normal physiology of insects is a necessary basis for studies to determine the effect that various kinds of poisons may have on the insect. Physiological studies and investigations on insects are a part of the activities carried on under the project and involve studies to determine the relation of insects to external and internal environmental factors. These serve as a basis for determining the lethal action under abnormal conditions such as temperatures, poisons, etc.

Studies to determine the toxic effect of insecticides on insects include a group of related problems considered under this project. The object of studies of this nature is to determine the effect on insects of various compounds and to ascertain the lethal dosage of insecticides under varying conditions of temperature and humidity.

Tobacco has long been recognized as one of the standard insecticides. Studies are now under way to determine the possibility of using various forms of insecticides made from tobacco as stomach poisons as well as contact

poisons. These activities are carried on in cooperation with the chemists and include not only studies on tobacco extracts themselves but also the possibility of mixing them in a more effective manner with other materials which would serve as carriers.

(x) FUMIGATION INVESTIGATIONS

Appropriation Act, 1938.....	\$10,000
Budget Estimate, 1939.....	--
Decrease.....	<u>10,000</u>

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
Fumigation investigations.....	---	\$10,000	---	-\$10,000(1)

DECREASE

(1) The decrease of \$10,000 is apparent rather than actual, as it is proposed that the amount be transferred to and made a part of the item "Control Investigations" and the present item be discontinued. This appropriation was first included in the Act making appropriations for the fiscal year 1938. It provided for investigations to develop fumigants to be used in fumigating plants or plant products the interstate movement of which is restricted or prohibited by State plant quarantines or plant inspection laws.

The item "Control Investigations" also provides for the same objective and, in order that the work provided for under the item "Fumigation Investigations" may be made a part of the activities provided for under the older item "Control Investigations", it is proposed to discontinue the item "Fumigation Investigations" and transfer the funds to the item "Control Investigations." The present estimates provide for this, as will be seen under the item "Control Investigations."

(y) INSECTICIDE AND FUNGICIDE INVESTIGATIONS

Appropriation Act, 1938.....\$148,984
 Budget Estimate, 1939..... 148,984

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Chemical investigations on insecticides.....	\$145,500	\$148,984	\$148,984
Unobligated balance.....	3,484	---	---
Total appropriation.....	148,984	148,984	148,984

WORK UNDER THIS APPROPRIATION

This appropriation provides for investigations to develop better and cheaper materials for destroying injurious insects and fungi; the development of methods of manufacturing these materials; investigation of chemical and physical properties of such materials; and the study of chemical problems relating to composition, action, and application of insecticides and fungicides.

The activities under this project are concerned with chemical investigations to develop insecticidal materials for the control of insect pests and for the development of effective attractants or repellents which may be used to aid in combating insects. Particular attention is directed to insecticides which are less hazardous to users and less poisonous to anyone eating sprayed or dusted fruits and vegetables. The improvement of existing insecticides by detailed study of their physical and chemical properties is also under way. Investigations to originate and improve methods of analyzing insecticides and to devise cheaper methods of manufacture are activities which come under this project. The determination of the most effective chemical means of removing harmful spray residues from fruits and vegetables that have been treated with compounds containing arsenic, lead, copper, fluorine, or other insecticidal and fungicidal materials is also an important phase of the work. The studies under way are included under a number of work projects referred to in the following paragraphs:

Some of the most useful insecticides--for example, pyrethrum, nicotine, derris, and cube--are natural products of plant life. It is believed that there are many other plants which have insecticidal properties of value. The activities under this work project aim to discover such plants, study the constituents to which the toxicity is due, develop useful insecticidal preparations, and improve insecticides derived from plants containing insecticidal properties of known merit. Special attention is being given to derris, cube, and pyrethrum. An effort is being made to determine ways of preventing the decomposition of effective insecticidal properties of extracts of derris and cube and to study the relationship of the active insecticidal principles of

these plants, such as rotenone and deguelin. Study is being made of certain native plants to determine those which contain considerable quantities of rotenone and other active ingredients.

Investigations are under way to develop organic compounds which have insecticidal properties but leave residues relatively noninjurious to warm-blooded animals or man. Hundreds of organic compounds have been obtained or synthesized. Special attention is being given to the synthesis of organic compounds containing sulphur and to methods of using phenothiasine or derivatives that may be prepared from it.

Investigations of various chemical problems connected with the removal of spray residues are closely coordinated with investigations carried on in other units of the Bureau and in the Bureau of Plant Industry. An effort is being made to develop chemical methods for removing objectionable residues. Analyses are made to determine the amounts of residues resulting from various spray formulae. The work includes not only studies on apples but also studies on other fruits, such as peaches, grapes, berries, and certain vegetables such as cabbage. In addition to investigating the residues which result from the use of insecticides such as the arsenicals, attention is also being given to the development of methods of determining residues from organic compounds such as derris.

Studies on inorganic insecticides are directed to the improvement of common inorganic insecticides and the development of possible new combinations which have desirable characteristics. By far the larger part of the insecticides used belong to the inorganic group. Many of these are effective against the insect but are more or less injurious to the foliage. The reaction of these materials is variable and insecticidal properties may be improved and modifications made in their manufacture. Other materials may be developed by improving their physical properties. Calcium arsenate is being intensively studied to determine basic facts regarding it.

Chemical investigations on fumigants aim to develop new methods of using well-known chemical compounds for the fumigation of growing material or stored products to increase their efficiency and reduce the cost of operations. Chemical investigations on fumigants also aim to find new compounds which may be used as fumigants to determine the correlation between their chemical constituents and their toxicity to various insect pests. These activities are closely correlated with those of other units in the Bureau. Special attention is being given to fumigants for use in mills and milling machinery and fumigants that may be effectively used for the control of the resistant form of the California red scale of citrus.

The application of insecticides requires the use of substances which act primarily as carriers. Studies are under way to determine the composition, characteristics, and uses of a large class of materials which in themselves have no insecticidal properties but are used in conjunction with insecticides to improve their application. Materials of this class include those added to improve the distribution of insecticidal dust and those used to increase the wetting, spreading, penetrating, and adhesive properties of sprays. As a part of this activity a study is being made of stabilizers to protect various materials from the effect that weather conditions may have on their toxicity. A wide variety of products is studied in connection with these activities.

Goldfish respond to many poisons in a manner similar to many insects. They can be maintained throughout the year in the laboratory and are readily available as test animals. By using them in initial tests, studies to develop new plant materials and organic compounds which may be used as insecticides are expedited. Goldfish are now used largely to obtain information on the question of the correlation between toxicity and the chemical composition of certain compounds such as phenol and its derivatives, with particular emphasis on the derivatives of thiophenol.

In carrying on both the investigational and control activities of the Bureau there is need to have many materials analyzed so their constituents will be known. The chemical activities of this type are primarily of a service nature but include the analysis of samples of miscellaneous insecticidal materials to determine whether they meet specifications and the determination of the constituents of materials tested by various laboratories of the Bureau, and hence usually have a definite bearing on research.

(z) TRANSIT INSPECTION

Appropriation Act 1938.....\$44,059
 Budget Estimate, 1939..... 44,059

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Transit inspection.....	\$29,012	\$44,059	\$44,059
Unobligated balance.....	47	- - -	- - -
Total appropriation.....	29,059	44,059	44,059

WORK UNDER THIS APPROPRIATION

This appropriation provides for the inspection in transit of articles regulated by plant quarantines to determine whether they are being transported in violation of such quarantines. The only means by which the Department can be assured that safeguards required under plant-quarantine regulations are being followed in the case of mail, express, and freight shipments is to maintain a system of inspecting these products while in transit. This work consists of checking such shipments at important railway centers and transfer points to intercept articles which may be moving in violation of the quarantines. The prompt discovery of any weakness in inspection or certification makes it possible to correct faults or add necessary safeguards for the prevention of the establishment of pests at points far removed from the infested area. Experience has shown that, when the Department fails to check shipments at railroad centers and transfer points, uninspected, untreated, or uncertified products, which may be infested, are transported by common carriers into uninfested areas and thus threaten the establishment of these pests in such areas. The transit inspection

service not only turns back several thousand packages every year but it also serves to keep the employees of common carriers informed of quarantine requirements and thus obtains their active support in cooperating with the Department in its enforcement of Federal quarantines.

(aa) FOREIGN PLANT QUARANTINES

Appropriation Act, 1938.....\$680,000
 Budget Estimate, 1939..... 680,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
1. Import and permit service for issuance of permits for the importation of plants and plant products to comply with plant quarantines.....	\$53,348	\$58,348	\$58,348
2. Inspection at ports of entry of plants and plant products regulated by plant quarantines.....	572,150	621,652	621,652
Unobligated balance.....	458	- - -	- - -
Total appropriation.....	625,956	680,000	680,000

WORK UNDER THIS APPROPRIATION

General.-- This appropriation provides for administering various quarantines and regulatory orders to prevent the entry into the United States from foreign countries, Puerto Rico, and Hawaii of injurious insects and plant diseases by controlling and safeguarding the entry of plants and plant products. These activities include the enforcement of (1) foreign plant quarantines and regulatory orders issued under the Plant Quarantine Act of 1912, as amended; (2) rules and regulations governing the entry into the United States of railway cars and other vehicles, etc., from Mexico; (3) the Act of 1905 governing the importation of living insects into the United States; and (4) regulations governing the shipment of plants and plant products to the mainland from Hawaii and Puerto Rico.

The operations divide into two groups. One is concerned with authorizing the importation of plants and plant products which may enter the United States under the quarantines and regulatory orders. The other deals with inspections at ports of entry to detect and exclude dangerous plant pests and to see that plant material imported under permit meets the requirements of the authorization.

1. Import and permit service for issuance of permits for the importation of plants and plant products to comply with plant quarantines.--This project provides for the issuing of permits authorizing the entry of plants and plant products which can be imported without introducing dangerous plant pests. It is necessary to limit the entry of plants and plant products to those which represent the least pest risk or to those which may be adequately safeguarded. Plants and plant products imported into this country from abroad come under permit which gives a record of volume, nature of contents, and destination and point of origin. Material accompanied by permits issued in advance is later inspected to determine that the requirements have been fulfilled. These inspections and, if necessary, disinfection or rejection take place usually at the port of entry, except in the case of nursery stock which is inspected at certain designated points where facilities exist for the care of living plants during their inspection. The issuance of permits requires a large amount of correspondence and the making and maintenance of records. The work is done for the greater part in Washington.

2. Inspection at ports of entry of plants and plant products regulated by plant quarantines.--This project provides for inspection of plants and plant products at ports of entry to protect the United States from injurious insects and plant diseases. This includes work at the maritime ports of entry, the principal Mexican border ports of entry, the principal ports of entry along the Canadian border, in Puerto Rico, Hawaii, and in the District of Columbia. It provides for the District of Columbia inspection service in order that domestic plant material entering or leaving the District may be inspected and certified to meet the requirements of States to which it is consigned and inspection and certification for that plant material imported and distributed by the United States Department of Agriculture. It also provides for the inspection and certification for movement to the mainland of plants and plant products permitted from the territory of Hawaii; and for the protection of Puerto Rico against the entry from foreign countries of injurious insects and plant diseases, and for preventing the movement to the mainland of injurious insects and plant diseases known to occur in Puerto Rico. The various activities involve (1) the inspection of ships, airplanes, railway cars, automobiles, and other vehicles, mail packages, passengers' baggage, ships' stores, and the belongings of travelers entering this country at border ports of entry from Mexico; (2) the inspection of materials entered under permits; (3) the inspection of certain classes of plants in the field, following initial inspections at ports to assure absence of disease or pests which cannot be detected by one inspection; (4) the inspection of plant-introduction gardens maintained by the Bureau of Plant Industry; (5) the supervision of treatments of plants, plant products, or other articles which may be required as a condition of entry; and other activities necessary to carry out the purpose of the project.

(bb) CERTIFICATION OF EXPORTS

Appropriation Act, 1938.....\$31,862
 Budget Estimate, 1939..... 31,862

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)
Certification of exports.....	\$31,800	\$31,862	\$31,862
Unobligated balance.....	62	- - -	- - -
Total appropriation.....	31,862	31,862	31,862

WORK UNDER THIS APPROPRIATION

This item provides for inspection and certification of fruit or other plant products to meet the sanitary requirements of the countries to which it is intended the products will be shipped. The inspection made is that necessary to issue the certificate required by the country of destination as a condition of entry. The work is carried on at various ports from which the products may be shipped. It is a service to American exporters, and a nominal fee is charged for this work. This fee is, however, not sufficient to make the project self-supporting. Ninety-one foreign countries now are requiring inspection and certification with respect to the presence of insects and plant diseases on fruit or other plant products imported from the United States. The American exporter is required to furnish a certificate indicating freedom from dangerous insect pests and plant diseases. If American growers are to maintain their markets in foreign countries having these requirements, it is necessary that all such shipments be carefully inspected.

(cc) SCREWORM CONTROL

Appropriation Act, 1938.....\$75,000
 Budget Estimate, 1939..... - - -
 Decrease..... 75,000

PROJECT STATEMENT

Projects	1937	1938 (Estimated)	1939 (Estimated)	Decrease
1. Screwworm educational and control operations.....	\$318,318	\$75,000	- - -	-\$75,000(1)
2. Control measures for screwworms.....	39,070	- - -	- - -	- - -
Unobligated balance.....	87,612	- - -	- - -	- - -
Total appropriation.....	445,000(a)	75,000	- - -	- 75,000

(a) Excludes \$15,000 of 1937 appropriation obligated in 1936.

DECREASE

(1) The estimates for 1939 do not provide for the continuation of the cooperative control campaign on screwworms, and the special language authorizing this work is eliminated.

The appropriation for the fiscal year 1938 was provided to enable the Bureau to keep in touch with the screwworm situation in livestock, detect localized occurrences of the pest that may cause outbreaks, and give such information as may be necessary for its control. This follow-up of the more intensive educational campaigns carried on with the larger appropriations for the fiscal years 1936 and 1937 has brought information now available on control methods to the attention of stockmen and others throughout the range of the pest. The screwworm has not occurred in outbreak numbers in any section during the current season. Stockmen and others have had an opportunity to become familiar with recommended control measures. The special educational and related activities on this pest may be discontinued and work of this type handled through the same general channels as that of many other important insect pests. The investigational work will continue and information on control will be distributed by county agents and through other means.

WORK UNDER THIS APPROPRIATION

The appropriation for screwworm control for 1938 was provided to enable the Bureau to keep in touch with the screwworm situation in livestock, to detect localized occurrences of the pest that may cause outbreaks, and to give such information as may be necessary for its control.

During the fiscal years 1936 and 1937 larger appropriations were made available for work on screwworms. These provided for determining and applying methods for the control of these major pests of livestock and wild animals, including research, educational, and demonstrational activities. With these larger appropriations intensive educational and demonstrational activities were carried on in the areas where screwworms normally occur and information was made available to stockmen and others on methods for combating screwworms. These activities very largely contributed to the reduction of the pest, and it has not occurred in outbreak numbers in any section during the past season. The appropriation for the fiscal year 1938 was materially reduced and the activities conducted under this item modified to include only the objectives outlined in the preceding paragraph.

(dd) CONTROL OF EMERGENCY OUTBREAKS OF
INSECT PESTS AND PLANT DISEASES

Appropriation, 1938 (Pub. Res. 55, 75th Congress
approved July 17, 1937).....\$1,000,000
Budget Estimate, 1939.....2,000,000
Increase.....1,000,000

PROJECT STATEMENT

Projects	1937 Obligations	1938 (Estimated)	1939 (Estimated)	Increase
Incipient and emergency outbreaks of plant pests.....	\$579,400	\$635,600		
1937 appropriation obligated in 1938.....	+420,600	-420,600	\$2,000,000	+\$1,000,000(1)
Unallotted balance.....	---	785,000		
Total appropriation.....	1,000,000	1,000,000	2,000,000	+ 1,000,000(1)

INCREASE

(1) The increase of \$1,000,000 provides for an appropriation of \$2,000,000, specifically authorized, which enables the Department to cooperate with outside agencies in the eradication or control of incipient and emergency outbreaks of insect pests and plant diseases.

Public Resolution 20, 75th Congress, approved April 6, 1937, authorizes appropriations of \$2,000,000 for the control of incipient and emergency outbreaks of insect pests and plant diseases. This legislation also authorizes appropriations for each fiscal year sufficient to restore the fund to the full amount authorized. Two appropriations of \$1,000,000 each have been made under this authorization, (Pub. Res. 26, 75th Congress, approved April 27, 1937, and Pub. Res. 55, 75th Congress, approved July 17, 1937), both of which are limited as to the time they remain available terminating at the end of the current fiscal year, June 30, 1938. No funds provided under the authorization will, therefore, remain available for the fiscal year 1939. The full amount of the authorization, \$2,000,000, is requested.

The authorization specifically refers to certain insect pests, such as grasshoppers, chinch bugs, and Mormon crickets, which often occur in outbreak numbers over wide areas, and provides for cooperation with State and local agencies for their control. During the past season grasshoppers and Mormon crickets appeared in outbreak numbers over a number of States, attracting wide attention and causing demands for assistance in their control. The major part of the funds provided under the general authorization was allotted for cooperative work for the control of grasshoppers. The best information now available indicates that both grasshoppers and Mormon crickets will again occur in outbreak numbers over wide areas in many States during the coming crop season unless unpredictable natural conditions intervene and effect control. It is impossible to forecast when incipient outbreaks of new pests may occur.

An incipient outbreak of an important new pest was located in parts of Florida and Alabama during the past season. This insect, the white fringed beetle, is native to South America, and when discovered in this country had demonstrated that it was a pest of considerable importance. A small amount of the funds provided under the general authorization was made available to cooperate with States in an effort to eradicate the insect. The work against this pest should continue, and it is anticipated that the funds needed to continue necessary work against this pest will be provided from this item.

The funds to be provided under this appropriation are to meet emergent and unusual situations and the need for such funds has been repeatedly demonstrated. Since such conditions cannot be accurately forecast, it is, however, impossible to accurately indicate even approximate amounts that may be required to meet situations that may arise. If incipient and emergency outbreaks of plant pests do not occur, the funds will not be expended.

Since funds provided under this appropriation are to be used for the eradication or control of incipient and emergency outbreaks of insect pests and plant diseases and are to meet unusual and unforeseen situations and expenditures will depend on conditions which may or may not arise during the season when such pests are active, allotments to specific activities are not possible. The following tabulation gives the amounts expended during 1937 and indicates the estimated allotments for various activities so far carried on under funds provided for the purpose by the two joint resolutions appropriating funds for the fiscal years 1937 and 1938:

Activities	1937	1938
1. Cooperation with States in grasshopper control..	\$575,000	\$550,600
2. Cooperation with States in control of army worm.....	4,400	---
3. Cooperation with States in control of Mormon crickets.....	---	20,000
4. Operations to eradicate white fringed beetle....	---	65,000
1937 appropriation obligated in 1938.....	+ 420,600	-420,600
Unallotted balance.....	---	785,000
Total.....	1,000,000	1,000,000

CHANGE IN LANGUAGE

Previous appropriations under the general authorization have been provided by joint resolutions. The item is here recommended for inclusion in the Act providing regular appropriations for the first time. The recommended language is identical with that included in the two joint resolutions providing appropriations under the general authorizing Act with the following exceptions:

(1) The elimination of the introductory and other phrases customarily used in joint resolutions;

(2) The insertion of the words "to be immediately available" to replace similar provision included in the joint resolutions;

(3) The elimination of the following proviso:

"Provided further, That this appropriation shall be expended under the personal supervision and direction of the Secretary of Agriculture, who shall make a detailed report to the Secretary of the Senate and the Clerk of the House of Representatives of the several items of expenditures made hereunder."

The first change referred to above is recommended because the phrases eliminated are not necessary in connection with items included in the regular appropriation acts.

The second change is recommended to carry out the principles included in the authorizing legislation and the joint resolutions providing appropriations and will make the funds available to meet conditions that may arise during the crop season without regard to the fiscal year.

The third change is explained as follows: The expenditures under this appropriation would be made in accordance with the customary and established practice and be reported in detail in connection with the usual budget procedure. Special reports on such expenditures would, therefore, appear to be unnecessary. Requiring that the appropriation be expended under the personal

supervision and direction of the Secretary places inappropriate emphasis on this phase of the activities of the Department.

WORK UNDER THIS APPROPRIATION

This appropriation provides funds to enable the Department to eradicate or control incipient and emergency outbreaks of insect pests and plant diseases pursuant to authorization included in Public Resolution No. 20, 75th Congress, approved April 6, 1937. The appropriation is in the nature of an insurance fund and may not be required, either in whole or in part. The activities conducted with these funds will depend upon conditions which develop regarding pests. Previous experience has clearly shown that, if funds are immediately available to combat incipient and emergency outbreaks of insect pests and plant diseases, the work can be done more effectively and economically. The current season has amply demonstrated the need of funds for these purposes, which enabled the Department to cooperate with States in the control of outbreaks of grasshoppers and to take prompt measures to combat a new and emergent situation resulting from the discovery of a beetle new to the United States in limited areas in certain Southern States.

Public Resolution No. 20 authorizes an appropriation of \$2,000,000 for the control of incipient and emergency outbreaks of insect pests and plant diseases, including grasshoppers, Mormon crickets, and chinch bugs. It also authorizes that the funds appropriated shall remain available until expended and the appropriation of such additional sums as may be necessary to replenish the fund to its original amount at the beginning of each fiscal year. Two appropriations of \$1,000,000 each have been made under this authorization: the first by Public Resolution No. 26, approved April 27, 1937; and the second by Public Resolution No. 55, approved July 17, 1937. Both of these appropriations were made immediately available, to remain available until June 30, 1938. With this specific limitation on the time the funds will be available, no part of these appropriations can be used during the fiscal year 1939 to carry out the purpose of the authorizing resolution.

The funds provided by the two appropriations have been used very largely to enable the Department to cooperate with States in combating a widespread outbreak of grasshoppers. An estimate of \$2,000,000 for this purpose was submitted by the President to Congress on March 17, 1937. During the early spring of 1937, army worms appeared in outbreak numbers in certain States, particularly Oklahoma. These pests can be controlled in much the same manner as the grasshoppers by the application of poisoned bait. A small amount from the appropriation provided by Public Resolution 26 was used for the purchase and transportation of bait materials distributed to and used by cooperating States to combat army worms. In early July information was received regarding the occurrence of outbreaks of Mormon crickets in North Dakota and South Dakota. This was the first time that this pest had occurred in outbreak numbers in these two States. Work on the control of Mormon crickets was then under way in other States financed from allotments from emergency funds provided for relief. The period during which effective work could be done on Mormon crickets was short and the funds allotted from the emergency relief appropriation were not available for work in North and South Dakota. A small amount of the funds provided under Public Resolution No. 55 was allocated for work to control Mormon crickets in States where the control work had not been provided for by allotments from

emergency funds. In July an incipient outbreak of the white fringed beetle was outlined in limited parts of Alabama and Florida. This insect is a native of South America and was not previously known to occur in the United States. It attacks a wide variety of crops and has demonstrated that it is a potential pest of major importance over a wide area. In order that the Department might take immediate steps against this pest, a portion of the funds provided by Public Resolution No. 55 have been allotted for that purpose.

EMERGENCY AND A. A. A. FUNDS

(Complete Bureau Statement)

(1) Direct Allotments

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act, 1935:</u>		
Citrus-canker eradication.....	\$12,187	- - -
Control of phony peach disease.....	41,176	- - -
Control and prevention of spread of brown-tail moth.....	69,440	- - -
Control and prevention of spread of gypsy moth.....	256,040	- - -
White-pine blister rust control.....	844,919	- - -
Dutch elm disease eradication.....	179,427	- - -
Barberry eradication.....	358,959	- - -
Construction of field insectaries at Presidio, Texas.....	893	- - -
Eradication of wild cotton.....	6,094	- - -
Locating and destroying Thurberia plants....	43,247	- - -
Control of peach mosaic.....	15,924	- - -
General administrative expenses.....	6,581	- - -
Total, Emergency Relief Appropriation Act, 1935.....	1,834,887	- - -
<u>Emergency Relief Appropriation Act, 1936:</u>		
Control and prevention of spread of brown-tail moth.....	463,700	- - -
Control and prevention of spread of gypsy moth.....	2,002,000	- - -
Barberry eradication.....	1,584,750	- - -
Phony peach disease control.....	472,333	- - -
White-pine blister rust control.....	2,834,625	- - -
Mormon cricket control.....	333,000	- - -
Eradication of wild cotton.....	34,000	- - -
Eradication of Dutch elm disease.....	4,242,538	- - -
Locating and destroying Thurberia plants....	93,750	- - -
Citrus-canker eradication.....	174,300	- - -
Peach mosaic control.....	119,834	- - -
General administrative expenses.....	47,452	\$11,548
Total, Emergency Relief Appropriation Act, 1936.....	12,402,282	11,548

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Relief Appropriation Act, 1937:</u>		
Locating and destroying <i>Thurberia</i> plants...	- - -	\$39,426
Barberry eradication.....	- - -	574,206
Mormon cricket control.....	- - -	279,875
Eradication of Dutch elm disease.....	- - -	1,724,040
White-pine blister rust control.....	- - -	1,030,575
Control and prevention of spread of gypsy moth.....	- - -	786,395
Peach mosaic control.....	- - -	145,823
Phony peach disease control.....	- - -	75,290
Citrus-canker eradication.....	- - -	29,934
General administrative expenses.....	- - -	115,000
Total, Emergency Relief Appropriation Act, 1937.....	- - -	4,800,564
<u>Agricultural Adjustment Administration (Payments for Agricultural Adjustment in lieu of sugar tax funds):</u>		
Fruit-fly control in Hawaii.....	\$19,500	5,000
Insect pest survey in Puerto Rico.....	12,727	350
Total, Agricultural Adjustment Administration Funds.....	32,227	5,350
Total, Emergency and A. A. A. Funds (Direct Allotments).....	14,269,396	4,817,462

(2) Indirect Allotments

Projects	Obligated, 1937	Estimated obligations, 1938
<u>Emergency Conservation Work</u> (authorized by Act of March 31, 1933; financed through War Department): Control of insect enemies of forests.....	\$61,919	- - -
<u>Emergency Conservation Work</u> (authorized by Act of June 28, 1937; financed through War Department): Control of insect enemies of forests.....	- - -	\$58,200
Total.....	61,919	58,200

PASSENGER-CARRYING VEHICLES

An increase of \$11,755 (from \$35,125 in 1938 to \$46,880 in 1939) is submitted for the authorization for purchase of passenger-carrying vehicles. It is estimated that this amount will provide for the purchase of 76 cars, 72 of which will be replacements, and 4 additional cars.

The conservative policy followed by the Bureau in the purchase of passenger-carrying automobiles during the fiscal years 1936, 1937, and 1938 has resulted in the use of equipment to a point where in the interests of economy and efficiency it will be necessary to replace a substantial number of passenger-carrying vehicles during the fiscal year 1939. On the 76 machines which it is planned to purchase, there will be 62 direct turn-ins. Of these turn-ins, 44 are of 1934 or earlier model, and the average mileage of all machines to be turned in was in excess of 41,000 miles on August 1, 1937. Considerable more mileage will of course be added before the cars are actually exchanged. Ten will replace cars which have had extensive service but which it is in the interest of the Government to salvage for parts rather than to turn in. They are located at stations having extensive motor equipment, and it has been found from experience that the value of the salvaged parts for use in repairing other cars will exceed the amount the machines would bring if turned in. Not only will there be a saving in money but also a distinct gain in efficiency and convenience, due to the fact that these cars will provide replacement parts for old model machines for which parts can no longer be secured commercially without some delay.

The 4 additional cars are needed for the following purposes:

Two for use on the Sweet Potato Weevil Control project. This appropriation was provided for the first time during the fiscal year 1938, and, since it was included in the Agricultural Appropriation Act during the latter stages of its consideration, no authority was provided thereunder for the purchase of passenger-carrying automobiles. Two machines are urgently needed for the use of district supervisors in the Southeastern States. The nature of the travel performed by these men and the fact that they are frequently accompanied by other employees and cooperators make the use of trucks impracticable, and the use of employees' personally-owned cars on a mileage reimbursement basis is less desirable and economical than the purchase of Government cars.

Two for the use of inspectors of the Division of Foreign Plant Quarantines stationed at Philadelphia and New York City. Due to the heavy volume of work at these ports, it has been necessary during the fiscal year 1938 to provide additional inspectors. The machines covered by this estimate are needed to provide for this extra personnel, as well as to improve transportation facilities, which were inadequate for even the former staff.



